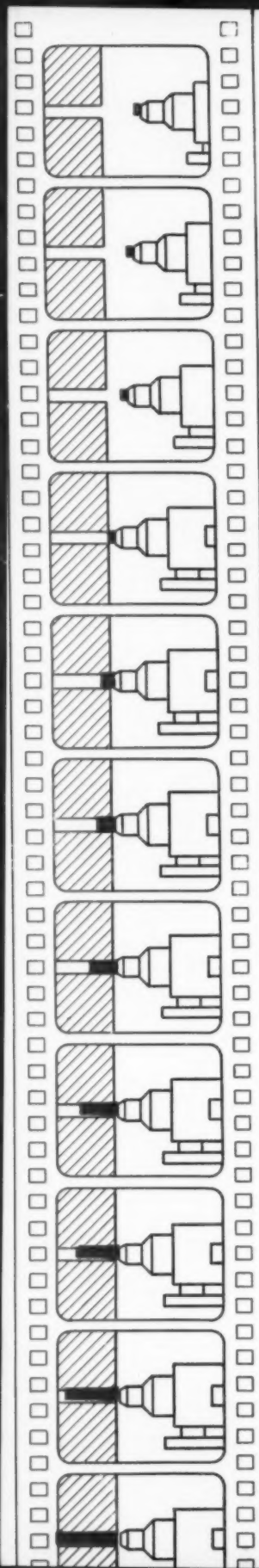
# the Tool Engineer

MARCH 1956

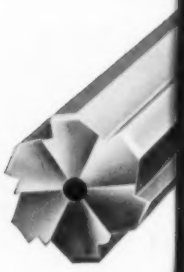
convention issue

PUBLICATION OF THE AMERICAN SOCIETY OF TOOL ENGINEERS



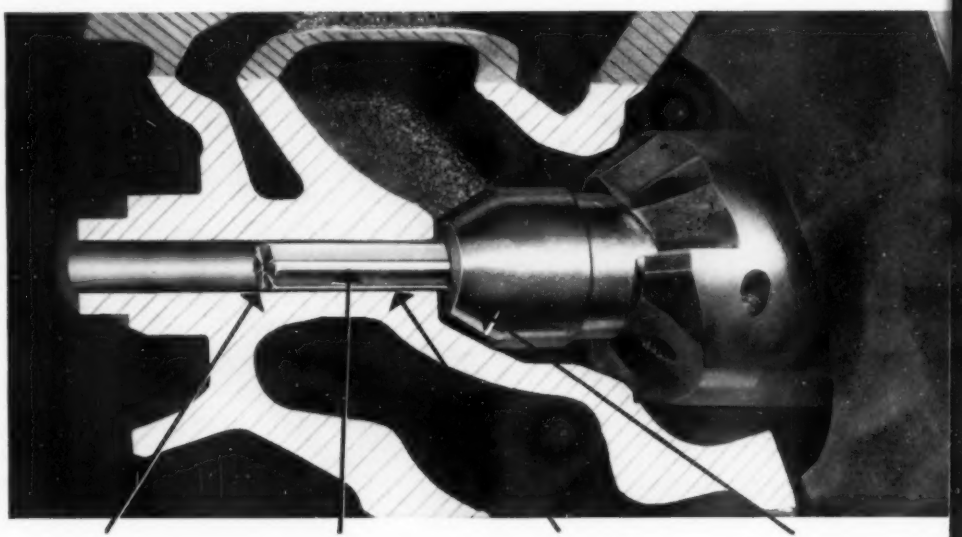
## New Heald Method of

# BORE REAMING



## keeps small-hole finishing

## on the STRAIGHT AND NARROW



CUTTING ACTION takes place here, at BORE REAMER end face.

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BORE REAMER, of solid tungsten carbide, feeds out into hole.

SUPPORT BUSHING rotates with the BORE REAMER.

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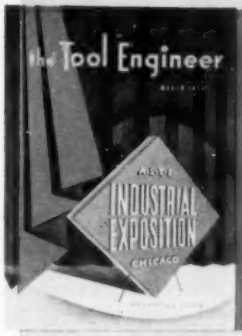
COVER: Announcing the 1956 ASTE Industrial Exposition in Chicago before the curtain is raised on this outstanding show. This will be a major feature of the Society's Annual Convention.





# The Tool Engineer

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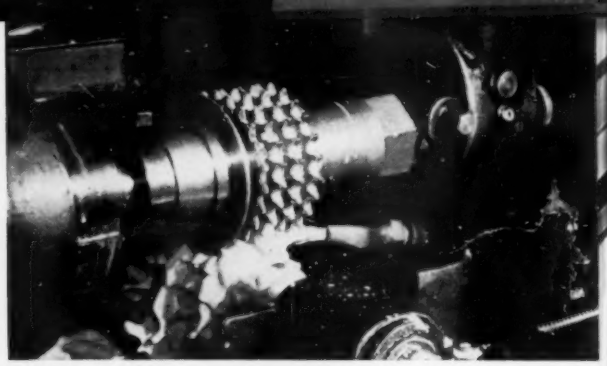
PLANNING · ENGINEERING · CONTROL · TOOLING · EQUIPMENT · PRODUCTION


THE TOOL ENGINEER is regularly indexed in the Engineering Index Service and the Industrial Arts Index

**TURNING AND DRILLING.** During the machining of a 9-in. piece using carbide-tipped tools, S.E.C.O. removes heat fast ...assures long runs, top speeds.



**HOBBING.** Flooding the cutting edges of a high-speed-steel hob working 1117 steel, S.E.C.O. provides lubricity and cooling power needed for long tool life.

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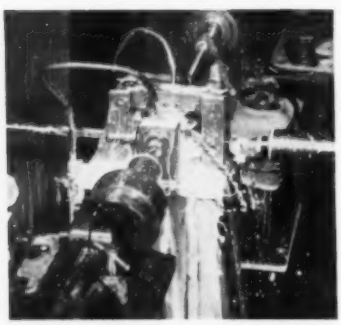

**DRILLING AND REAMING.** On steel forgings with a 350/400 Brinell, S.E.C.O. keeps drills cool...gives clean cutting.

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# The Tool Engineer

## Your Convention Issue

Promising to be the most outstanding show in ASTE history, the Industrial Exposition in Chicago, March 19-23, has "Tooling for Tomorrow" as its theme. Over 500 companies will display and demonstrate the latest developments in manufacturing methods and equipment. The tool engineer will have an opportunity to see how these developments may be used to solve *his* production problems. Also, the show will aid him in planning for the future and for the inevitable increased competition ahead.

To aid in planning a visit to the show, a special Exposition Section in this issue discusses developments in tooling. This section analyzes the significance of new production equipment, based upon the outstanding products to be exhibited at the show. In addition, floor plans, booth numbers and listings of exhibitors and products displayed will be included. This preview will present many of the show highlights.

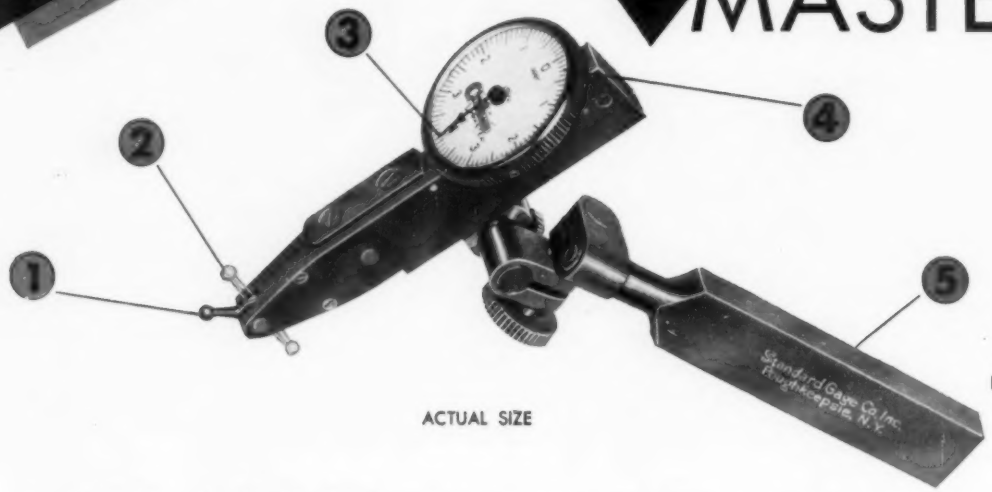
Having the same theme as the Exposition, the Convention will include over 60 technical papers. Biographical sketches of some of the authors and brief summaries of their papers are contained in the special Convention Section. Other papers were reviewed in the previous issue. In addition, four typical papers are abstracted in the Technical Section to indicate the type and caliber of these meetings. All will be available as individual papers or complete in the "Collected Annual Papers."

We hope this issue will serve to make you a part of your Convention whether or not you plan to attend.

John W Greve

EDITOR

# ANNOUNCING the CHECK MASTER

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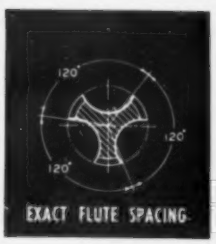

EXACT FLUTE SPACING

UNIFORM FLUTE CONTOURS

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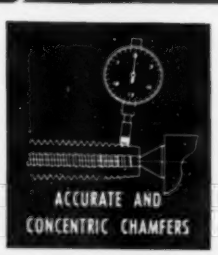
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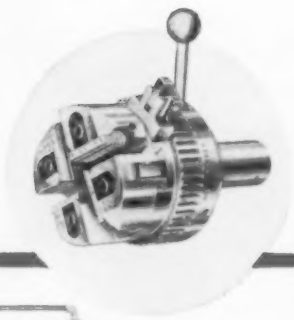
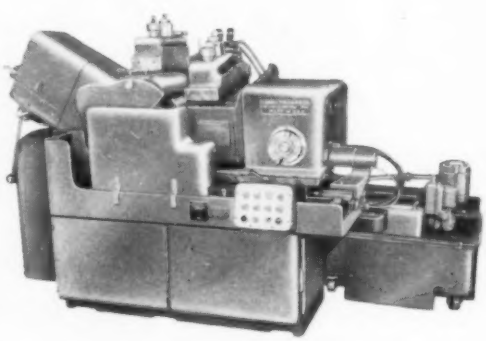
# Cutting, Grinding, Tapping,





## Cutting....

The 8C LANDMACO—one of five new Thread-Cutting machines designed for precision threading of workpieces from 3/16" to 6 3/4" in diameter. • Above is the new 2" LANDMATIC—one of the many Standard and Special Thread-Cutting Heads designed for application to Automatics and Turret Lathes.

## Grinding....

The CENTERLESS Thread Grinder for continuous thru-feed grinding of threads from 1/16" to 2" in diameter at mass production rates. Infeed grinding attachment available for threading shouldered or headed workpieces which cannot be cut or rolled due to material hardness.

# Rolling THREADS

More than 350 sizes and styles of Machines and Tools are manufactured by LANDIS for producing all types of internal and external, straight and tapered threads by one of these three basic threading methods.

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The Threading Experience developed through these years is an important LANDIS extra available to all manufacturers. Our Engineering Department will be glad to work with your organization on any problem dealing with method, equipment, or thread design. Send us your specifications—let us recommend the Threading Equipment best suited to your need.

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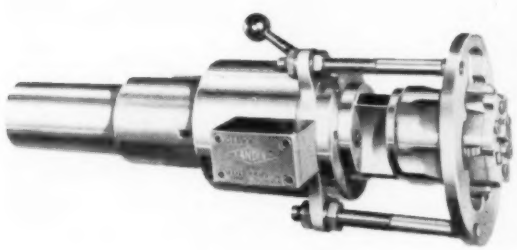
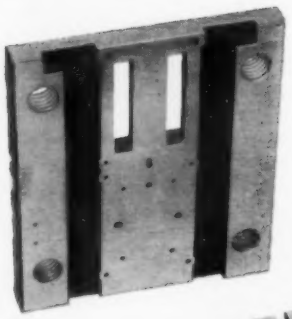


## Tapping....

The LL Collapsible Tap for producing internal tapered threads featuring detachable heads for wide range coverage. Other LANDIS Taps include Rotary or Stationary Standard Taps for straight or tapered threads, Solid Adjustable Taps, Valve Taps, and Taps for other special applications.

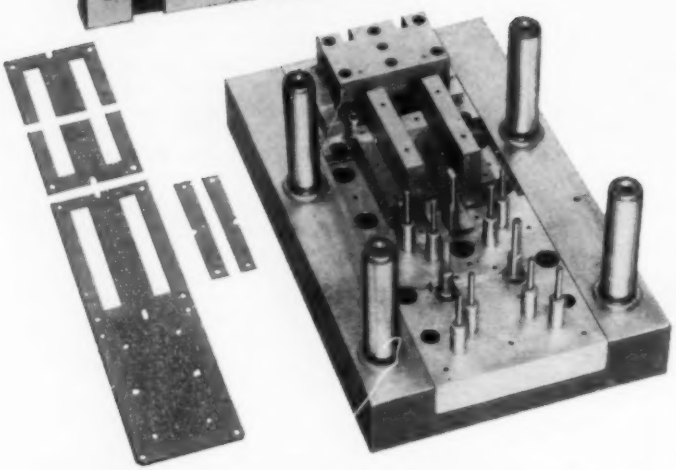
## Rolling....

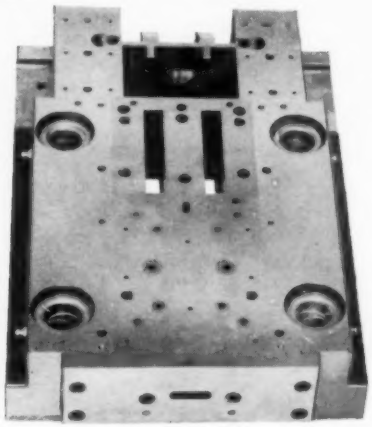
The new LANHYROL Thread Rolling Machine, revolutionary in its output, accuracy and flexibility. • Above is the #20 LANROLL Attachment—one of five sizes of Thread Rolling Attachments for Automatics and Turret Lathes.



**Kennametal Grade K92 outwears steel 15 to 1 in stamping "E" and "I" laminations**

Operating at 400 strokes per minute in a 25-ton press, a Kennametal die produced 1,000,000 "E" and "I" pieces per grind, against 95,000 for steel, and a total of 150,000,000 units, against only 10,000,000 for steel. That is a 15 to 1 ratio in favor of Kennametal. Material involved was .0185" thick silicon steel. Kennametal Grade K92 was selected because of its high strength, long life, ability to stay sharp for extended periods of time and produce accurate laminations free of rough edges.





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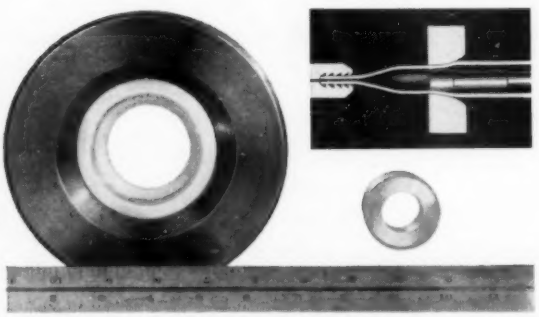

**Tube drawing increased from 500 feet to over 75 miles; Nib cost cut from 40¢ to 1¢ per 100 feet of tubing**

Against average life of only 500 feet of tubing for chrome coated steel mandrel, a mandrel nib of Kennametal Grade K84 showed only .003" wear after 75 miles of tubing. In addition to reducing nib costs from 40¢ to 1¢ per 100 feet of tubing, great savings were realized on reduced scrap and lower machine downtime for mandrel changing. Kennametal Grade K84 was used for cold drawing 1½" diameter, .083" wall seamless steel tubing to 1 5/16" diameter.

**Ask for Booklet B-100**

A-9417

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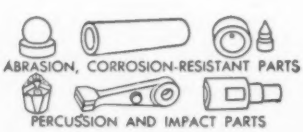

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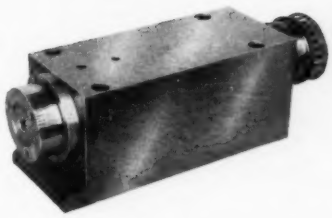

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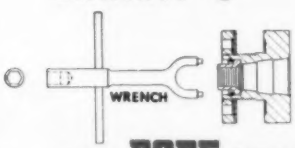


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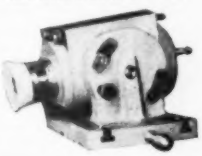
**EXHIBIT E**



**POPE** SUPER-PRECISION MOTORIZED TOOL AND CUTTER GRINDER SPINDLES with clearance Angle Swiveling Heads for *Angular Adjustment In A Vertical Plane*

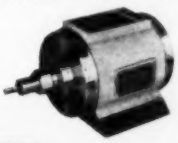
**EXHIBIT F**

**POPE** HEAVY DUTY VEE-BELT DRIVEN, PRECISION MILLING SPINDLES, and Wheel Heads, ½ to 50 HP

**EXHIBIT G**

**POPE** INTERNAL GRINDING SPINDLES for Bryant, Excello, Heald and Landis Grinders.

**EXHIBIT H**



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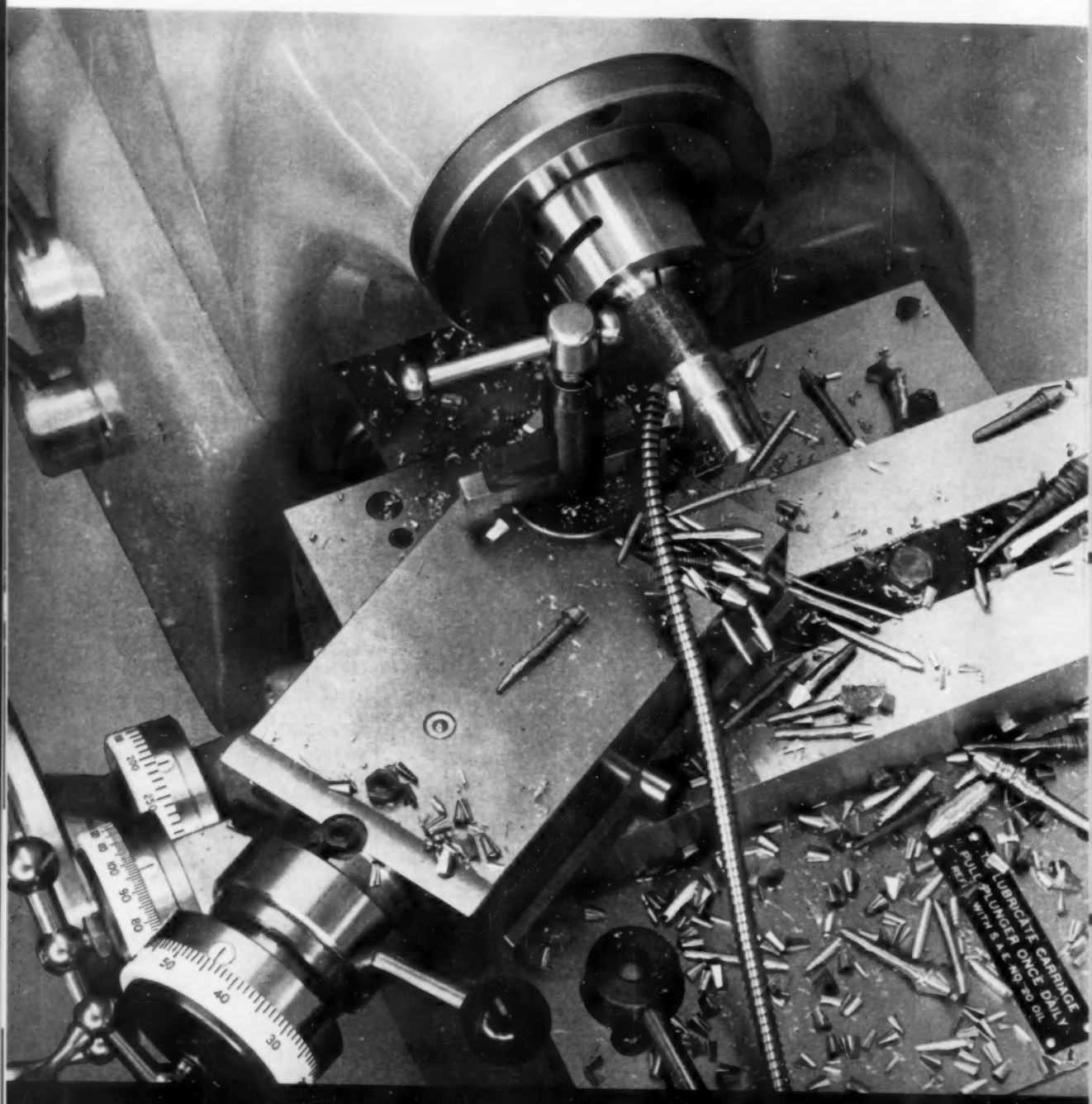
261 RIVER STREET · HAVERHILL, MASSACHUSETTS

HARDINGE

*See*

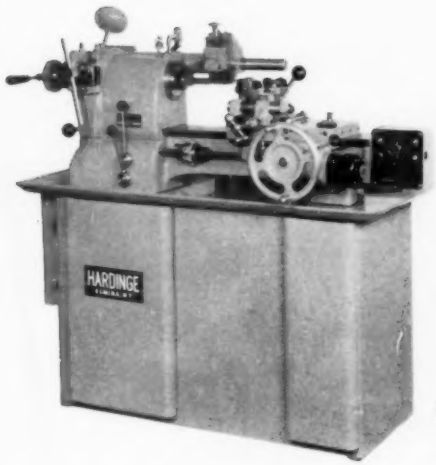
# HARDINGE MACHINES IN ACTION




"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

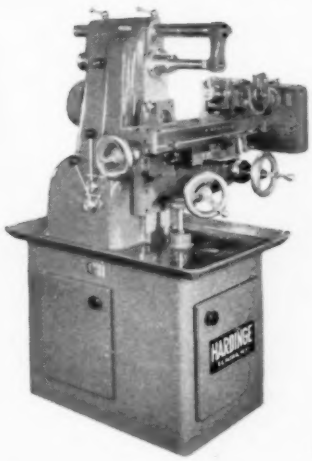
# *Visit* HARDINGE SPACE 452

## *at the* A.S.T.E. SHOW – MARCH 19-23

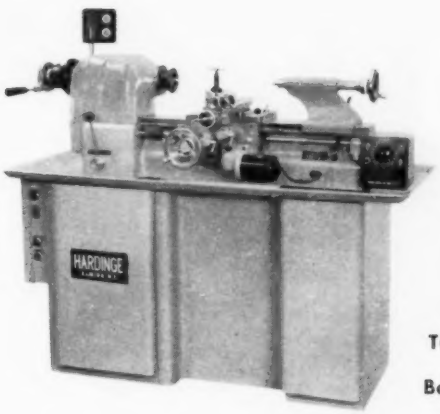



Model HCT
Chucking Machine
with
Threading Head

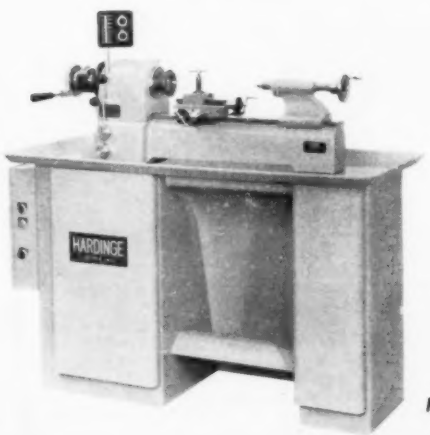
Model DSM59
Second
Operation
Machine



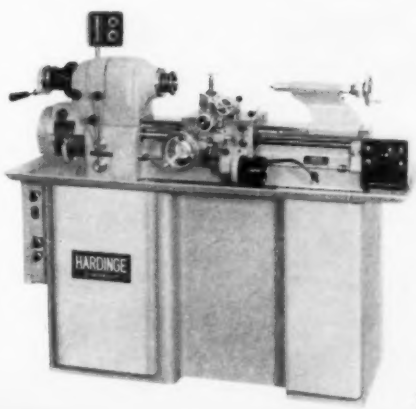

Model UM
Universal
Milling Machine




Model TFB
Turning, Facing
and
Boring Machine




Model DV59
Lathe




Model HLV
Tool Room Lathe

**HARDINGE BROTHERS, INC., ELMIRA, N. Y.**

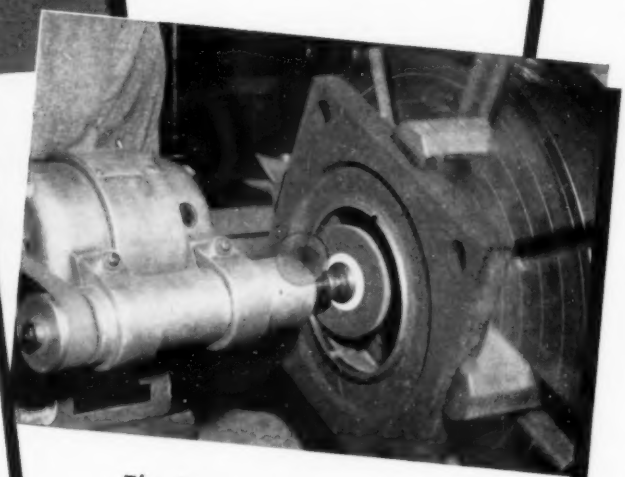
# The INSIDE STORY of INTERNAL GRINDING by NORTON

*How Norton wheels for internal grinding step up your product quality and profits with the*

**"TOUCH of GOLD"**

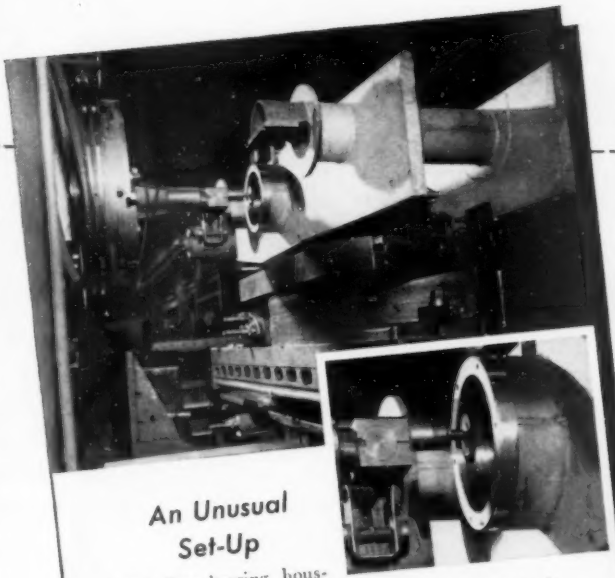
## They're Precision-Processed

Norton wheels for internal grinding are built by exclusive precision-processing that results in absolutely uniform grinding action, in wheel after wheel of the same specifications. This means you can depend on each Norton wheel of the same specifications for exactly the same grinding action. No fussing with timing cycles when you change wheels — you save on every grinding job. Other typical "Touch of Gold" advantages include their fast, free, cool-cutting action and extra long life. Norton wheels are made in types, sizes, bonds and abrasives for every internal grinding application.



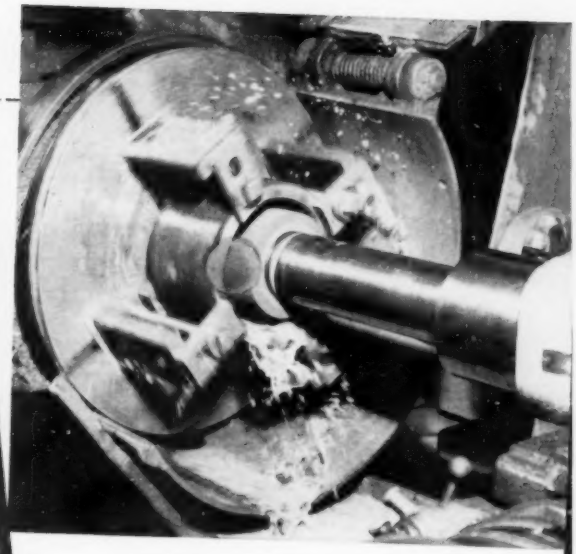
## The Famous Norton G Bond

The Norton G Bond is the most efficient vitrified bond ever developed for precision and semi-precision grinding. Holding each abrasive grain just long enough for maximum cutting action, it assures a constant grinding surface of fresh, sharp cutting edges. As a result, G Bond wheels cut cooler and faster . . . produce smoother finishes . . . dress easier and give more pieces per dressing. With Norton 32 ALUNDUM* abrasive — outstanding for heavy feeds and rapid stock removal — it makes an ideal "Touch of Gold" combination for your grinding jobs on steel and steel alloys.



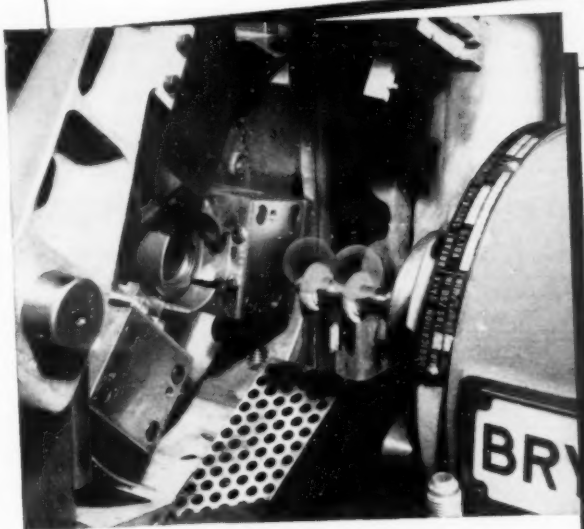
## An Unusual Set-Up

Grinding bearing housings with a Norton wheel on a Dumore tool post grinder, mounted on a horizontal boring mill. The grinder itself revolves in a planetary motion, the grinding wheel spindle following the I.D. of the hole. To grind the other end of the housing the work table is turned 180°. *Material:* cast steel. *I.D.:* 7.8737". *Stock removal:* .005" each end. *Limits:* +.0001", −.0004". *Time:* two hours each end



## Rounding It Out — Fast

During hardening, a certain amount of warpage occurs in this steel mould band. A Norton wheel is grinding it perfectly round and smooth. The band has an I.D. of 6" and is 4" deep. Average amount of stock removal is .040" and the time cycle is 30 minutes.



## Precision Performance — Doubled

Here a Norton two-wheel set-up is ready to go into fast grinding action. The job is grinding a double race in a steering gear bearing. *Material:* SAE 1045 steel, 54 Rockwell C. *I.D.:* 1.1507". *Stock removal:* .012". *Limits:* +.0000", −.0005". *Finish:* 10 microinches RMS.

## See Your Norton Distributor

for further facts on how Norton wheels can bring the value-adding, money-saving "Touch of Gold" to your own internal grinding operations. He'll be glad to arrange a test in your plant. Or write direct to your nearest Norton district office. And remember: only Norton offers you such long experience in both grinding wheels and grinding machines. NORTON COMPANY, Worcester 6, Mass. Offices in nine cities. Distributors in all industrial areas — listed under "Grinding Wheels" in your phone directory, yellow pages. Behr-Manning, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated.

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**ABRASIVES**

*Making better products... to make your products better*

NORTON PRODUCTS: Abrasives • Grinding Wheels
Grinding Machines • Refractories

BEHR-MANNING PRODUCTS: Coated Abrasives
Sharpening Stones • Pressure-Sensitive Tapes

W-1683

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

# 300 H.P. and 60" FEED with Shear Clear Face Mills

These 14" Ingersoll carbide Shear Clear Face Mills, powered by two motor-driven heads of 150 h.p. each, are shown removing 7/16" of cast iron at feed rates of 60" per minute, more than three times the former rate. This roughing cutter can take up to 1-1/8" of tough metal.

Few Ingersoll customers will require 300 h.p. and the cutting capacity of these specially-designed heavy duty cutters. However, the experience gained through unusual operations such as this is reflected in the constant improvement of Ingersoll's standard line of inserted blade milling cutters.

Many of these design advancements, including the use of new cutting angles, are incorporated into the Ingersoll Shear Clear Face Mill. The patented Ingersoll Shear Clear will out-perform all other types of face mills. Its free cutting, shearing action permits much higher feed rates, gives you smoother finish and longer tool life.

Here are some of the many types of Ingersoll Shear Clear Face Mills. Each Shear Clear has been developed for a particular class of work and has variations in cutting angles and blade materials for different metals. All Shear Clear Cutters offer the economies of inserted blade design, and can be furnished in various sizes with carbide-tipped, cast alloy or high speed steel blades.

For General Purpose Milling

For Aluminum

For Steel

For Light Cuts of Cast Iron

For Heavy Cuts of Cast Iron

Write Today for Ingersoll Cutter Catalog No. 66F.

THE INGERSOLL MILLING MACHINE COMPANY
ROCKFORD, ILLINOIS, U.S.A.

BUILDERS OF SPECIAL DESIGN MILLING & BORING MACHINES
ORIGINATORS OF SHEAR CLEAR CUTTERS

# Production Pointers from GISHOLT

MASTERLINE GISHOLT SINCE 1887

TIME-SAVING IDEAS

*Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help cut time and costs in your own work.*

## PRE-SET TOOLS IN MAGAZINE-TYPE TOOL BLOCKS SPEED CHANGE-OVER

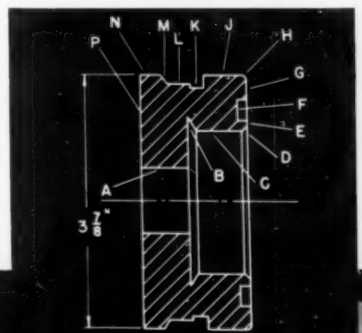
***Six Different Part Sizes Handled with Minimum Tool Setting Required***

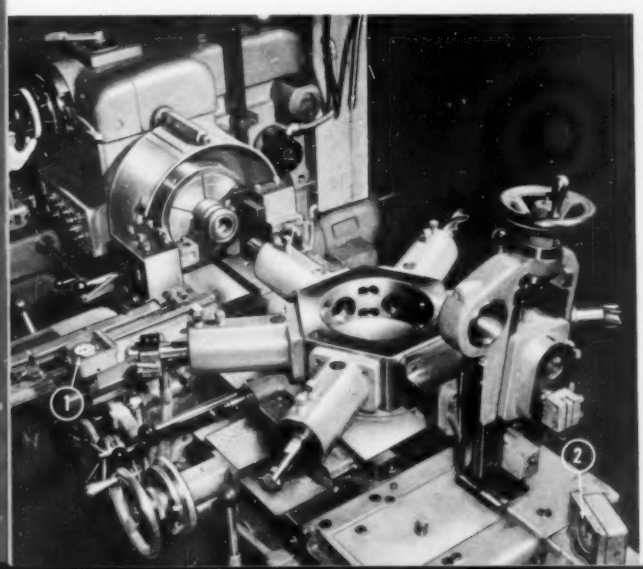
Here is a business-like setup, for producing various sizes of neck ring molds from 17″ long cored cast iron billets. The billets have been rough turned and cut in half prior to this machining operation.

This setup is on a 3⅞″ diameter neck ring mold. Surfaces A-B-C-D-F-J-N are machined from the hexagon turret. Critical lengths are easily held, using a "tenth" indicator on the turret saddle. Surfaces E-G-H-K-L-M are handled from the front of the bridge-type cross slide, with multiple tools held in a longitudinally adjustable magazine-type tool block. The tools are hand fed to depth with close dimensions checked by a second "tenth" indicator. Cut-off is at P from the rear of the cross slide. Floor-to-floor time is 10.3 minutes.

The spindle on this sturdy Gisholt 1L Saddle Type Turret Lathe has a special 7″ pilot bore, for a depth of 18″ and a 15″ spindle nose. Thus the work is rigidly supported, back in the spindle, while machining is performed. A special collet chuck is used, with an air-operated pusher arrangement to feed the stock and an air blast in the bore to clear the jaws of chips before each new billet is inserted. A six-section master collet provides the necessary flexibility for chucking the six part sizes.

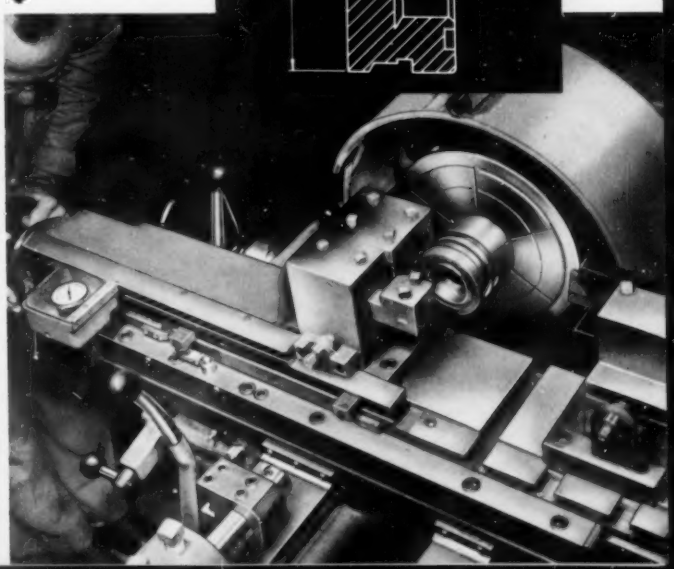
***Tools in magazine-type tool blocks are ground and pre-set to gauge in tool room to cut downtime. Tolerances are checked with dial indicators. Special spindle bore saves cost of larger capacity machine.***




Finished part being cut off from rear of bridge-type cross slide. Note "tenth" indicators mounted at (1) and (2).

Pre-set tools in magazine-type tool block are hand fed to depth as dial indicator provides visual tolerance check.



MASTERLINE GISHOLT SINCE 1887

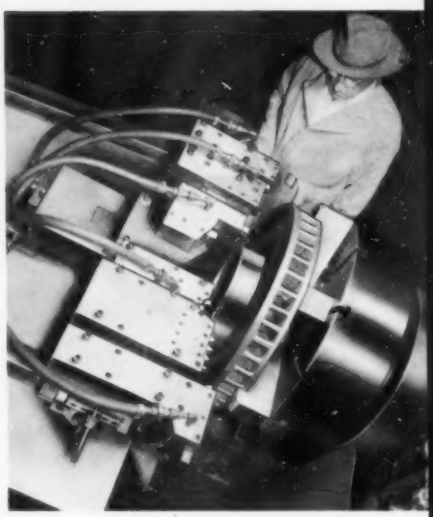
TIME-SAVING IDEAS

## 14 TOOLS MACHINE 11 SURFACES IN ONE OPERATION

### *Features Table Feed and Two-Speed Motor Arrangements*

This job is tailor-made for the rugged Gisholt Simplimatic Automatic Lathe. Tooling is planned for fast change-over, since machining operations on both sides of these 28″ diameter, 6½″ wide cast iron rotors are handled.

The second operation is shown. After chucking, the extra-wide platen table traverses the tooling to the work, and then changes to feed as the flange O.D. is turned with the tool at the rear while the facing tools on the rear slide are plunged to depth. Then, the rear slide feeds transversely with four tools dividing the rough cut across the flange face as others face and co-bore the hub I.D. At the same time, the center slide feeds forward to finish size and relieve the hub co-bore, bore the flange I.D. and round the hub and flange edges. As the rear slide tools complete the rough facing cut, the front slide trips the two-speed motor to the "high" side. A single tool finish faces the flange and another rounds the O.D. edge, completing the part. Floor-to-floor time on this job is just 13.8 minutes.



***Platen table provides maximum support with minimum overhang to eliminate vibration and improve accuracy. Two-speed motor arrangement on the Simplimatic provides a finer finish, both on the flange face and in the hub co-bore.***

Extra-wide platen table carries 3 tool slides. Fourteen tools machine a maximum number of surfaces in one operation.

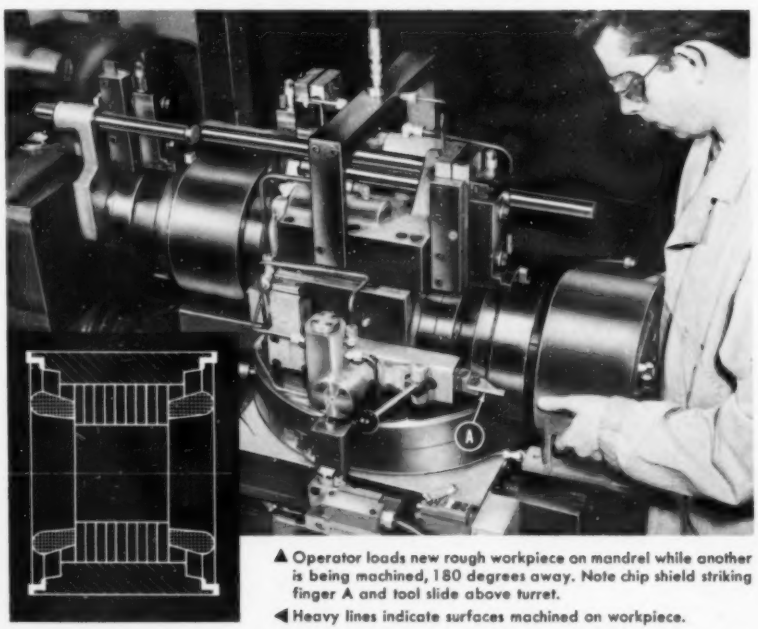
## THIS SETUP WHIPS UNPRODUCTIVE TIME

### *Chips Fly as Operator Loads and Unloads Parts*

Here's how rabbet fits on three basic sizes of cast iron electric motor frames are handled at a rate of 120 parts per hour. The machine is a Gisholt No. 12 Automatic Production Lathe, equipped with twin arbors on a special carriage-mounted indexing turret. The operator simply loads and unloads while machining is performed, incorporating former unproductive time into the machining cycle.

The motor frames arrive with windings already in place and the rabbet fits rough machined. The rabbet fit bores range from 8⅜″ to 9$^{29}/_{32}$″ in diameter. Expanding mandrels hold in stator bores ranging from 3¾″ to 6⅞″ in diameter. The depth of cut is the same on all parts, so the floor-to-floor time is set at 27 seconds.

Here's the cycle: operator removes finished part and places new workpiece on mandrel. Location is against chip shield striking finger (A) actuating switch, allowing arbor to expand chucking part in I.D. Finger A is retracted, clearing indexing circuit. When part is completed, carriage trips into reverse traverse and, when fully back, indexes 180 degrees and unchucks finished part. Carriage traverses forward, changing to feed as mating teeth on mandrel and spindle flange engage to drive work. Spindle starts. Continued forward feed of carriage engages overhead pusher rod with dead stop actuating tool slide over turret. Slide on turret feeds tool forward as carriage feed moves work into tool mounted over spindle, simultaneously machining the rabbet fits at both ends. As part is completed tools are relieved, carriage trips into reverse traverse and cycle repeats.




▲ Operator loads new rough workpiece on mandrel while another is being machined, 180 degrees away. Note chip shield striking finger A and tool slide above turret.

◀ Heavy lines indicate surfaces machined on workpiece.

***With workpieces weighing approximately 50 pounds, this method of loading and unloading has not only increased production by cutting unproductive time but has also reduced operator fatigue.***

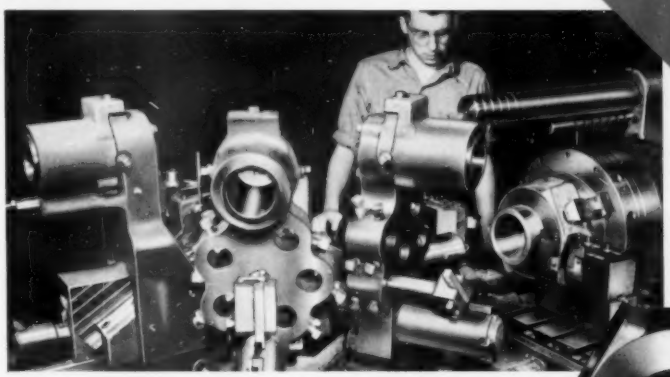
TIME-SAVING IDEAS

## AUTOMATIC TURRET LATHE CUTS COSTS ON SMALL LOT OPERATIONS

### *Versatile 2F Fastermatic Minimizes Effort, Shortens Change-over*

This manufacturer, with minimum investment, has improved medium-run machining operations on eight different types of pump bodies and housings. The workpiece shown is typical. A pot-type fixture is used, with the part locating against a previously machined face on a locating ring mating with a pilot diameter on the back of the part. Draw-back fingers hold in opposed port openings. The machining sequence is shown by the line drawings. Floor-to-floor time is only 9.40 minutes.

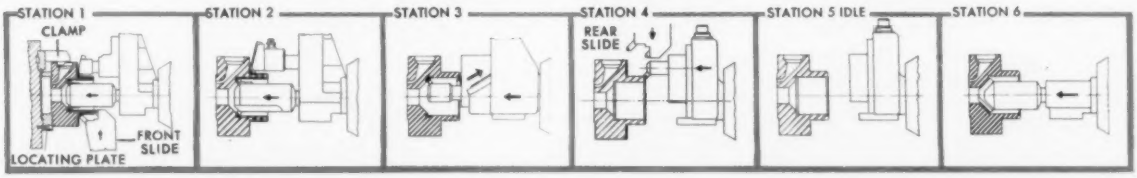
Piloted multiple turning heads provide maximum support and flexibility. Massive tool holders reduce overhang for accuracy and rigidity during heavy cuts. Adjustable block-type cutters speed boring operations and are interchangeable for different bore sizes. Special cross slide cams provide extra travel for facing the larger parts. Adjustable, tee-slotted tops further speed change-over.



Recess at base of bore is formed by internal facing tool at left, actuated by adjustable stop bar under overhead pilot on headstock.

Pump housing, showing surfaces machined. Large face is 9¾" in diameter; hub diameter is 6½".

***Heavy cuts are taken at maximum feeds and speeds with the ease and efficiency offered by automatic operation. Production is fast and quality consistent. During machining, the operator is free to inspect parts or perform other work.***

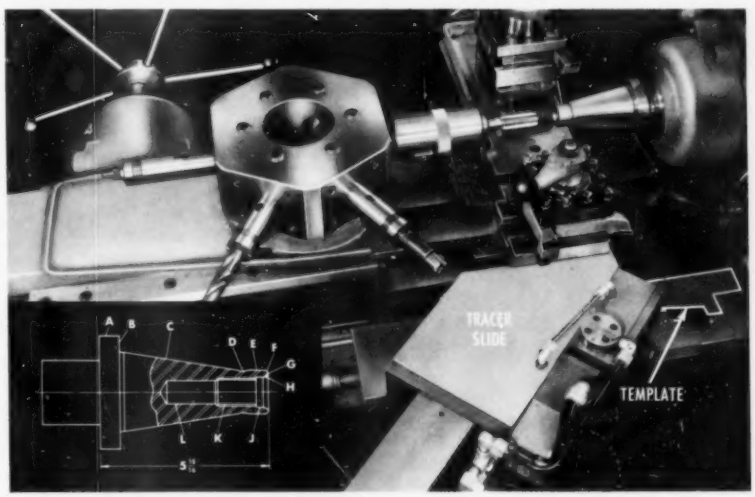



## STEPS UP PROFITS ON STEEL END MILL ARBORS

### *JETracer on Rear of Cross Slide Cuts Costs, Speeds Production*

You may get ideas here on cost-cutting with this combination—the new Gisholt MASTERLINE No. 5 Ram Type Turret Lathe with JETracer. Here's how they team up to machine the shank end of tough steel end mill arbor forgings, in only 9.73 minutes floor-to-floor time:

A hydraulically operated collet chuck holds the work. A-B-E-G are rough-machined by square turret tools from the front of the cross slide. The tracer slide carries a quick-indexing type square turret with roughing and finishing tools. In two fast passes, the JETracer rough- and finish-machines G-F-E-D-C-B-A, completing the O.D. The JETracer then retracts out of the way while standard tools on the hexagon turret center drill, drill L, co-bore J, form H and tap K to finish the operation.




***This combination provides all advantages of tracer operation, plus unrestricted use of hexagon turret for all additional operations on the I. D. of the piece.***

An indexing square turret on the Gisholt JETracer slide permits heavy roughing cuts and a light finish cut with a fresh second tool for close tolerance machining operations.

MASTERLINE GISHOLT SINCE 1887

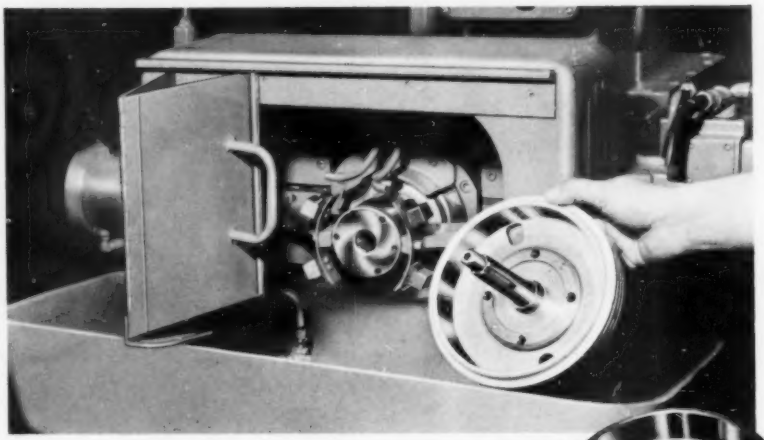
TIME-SAVING IDEAS

# GRINDING OPERATION ELIMINATED BY BRAKE DRUM SUPERFINISHER

## *Brake Drums Superfinished for More Area Contact, Longer Life*

By combining expert setup with an advanced process, a leading automotive manufacturer is improving quality, cutting costs and lengthening service life on rear brake drums. The process is Superfinishing—and the machine is a Gisholt Model 57 Brake Drum Superfinisher.

An air-operated collet chuck holds the work on the rear brake drum shaft. Depth stop is an internal plug, with drive against the splined shaft. After rough- and finish-boring, the braking surface is Superfinished down to ten micro inches R.M.S., or less. Floor-to-floor time per unit on this job is only 20 seconds—and savings are realized through elimination of the usual grinding operation.

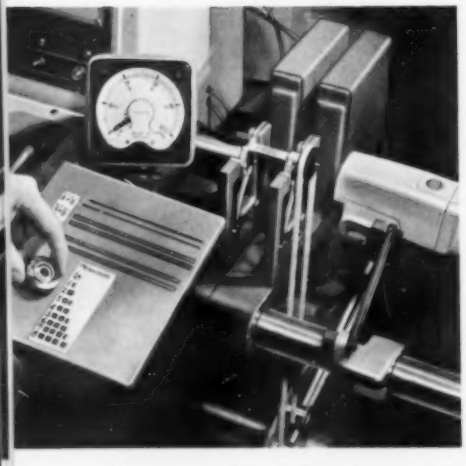


Gisholt Model 57 Brake Drum Superfinisher, showing workpiece, collet chuck and Superfinishing stones which move out to engage the brake drum I. D.

***Time is saved and unit cost is lowered with this setup—and the Superfinishing provides a better braking surface for faster, safer stopping action.***

Front brake drum is also Superfinished on second machine.

# ADHESIVE LEAD FOIL CORRECTS ROTOR UNBALANCE



Note size of workpiece compared to operator's hand. Sections of adhesive lead foil are cut to size and positioned for ready use.

## Unique Method with DYNETRIC Balancer Corrects Lightweight Parts

Here is a dramatic application which demonstrates the extreme accuracy of all standard Gisholt Balancing Machines. This job—handled by a 1S DYNETRIC Balancer with lightweight work supports—is a miniature D.C. motor rotor. The rotating section, a hollow wire winding weighing only 0.637 ounce, rotates about a central heavy core and shaft and requires a two-plane balancing operation.

Loading and unloading are simplified by balancing in an over-hanging position. Belt drive is used to rotate the workpiece at approximately 3000 r.p.m. Correction planes are located on each side of the winding, at a 0.625″ radius from center. The problem of the large parasitic mass of the central core, shaft and arbor is overcome—because Gisholt Balancers amplify unbalance effects electrically. By calibrating the Direct Reading Amount Meter, one unit on the meter is made to represent a ⅛″ x ¼″ piece of adhesive lead foil weighing only .001 ounce. The meter tells the exact amount of correction needed, and the strobe lamp tells the operator precisely where to apply the foil on each side of the winding. While still on the supporting arbor, the part is then corrected and inspected to make sure residual unbalance is less than ½ a meter unit—and the job is completed, in less than one minute f.t.f.!

***From the smallest to the largest rotating parts, you'll find a standard Gisholt Balancer available to meet your needs. Write for new general Catalog 1109-B.***

DYNETRIC BALANCERS GISHOLT

No. 3-456

654

**THE GISHOLT ROUND TABLE** represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY Madison 10, Wisconsin

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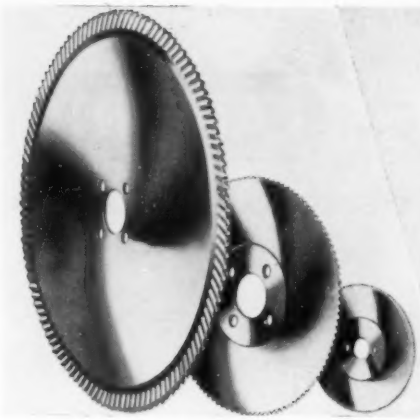
# Seeing is Saving

## at MOTCH & MERRYWEATHER'S booth 1021

### A. S. T. E. EXPOSITION, CHICAGO

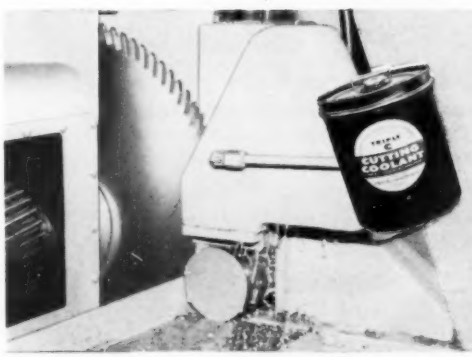


**M & M Triple-Chip Saw Blades**
**Save Waste in Metal Sawing**

Complete line — segmental and solid — cut-off up to 108" dia., slitting down to 3" — for any machinable material, ferrous or non-ferrous, any size, any shape, any thickness. Less tooth strain, longer blade life, substantial savings in time and costs.

**KROSLOK Milling Cutters**
**Save Time in Precision Milling**

Kroslok Face Milling Cutters and Shell End Mills cut any machinable material. Simplest design; only three members—body, blade, wedge. Serrations in body mate with cross serrations in blade. A profit-showing aid to accurate production milling.




**Three Triple C Products**
**Save Trouble in Tool Care**

Triple C Grinding Coolant, Cutting Coolant and Machine Cleaner are Cool, Clear, Clean. Anti-rust, non-greasy, smokeless, odorless, foamless, non-flammable, non-clogging, safe for operators. A notable contribution to tool maintenance.

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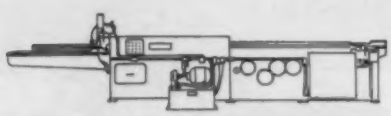
If you are machining parts involving repetitive operations — especially if the design is intricate — you should investigate the possibilities of Lapointe Broaching. . . . Our Broaching Machines are designed to meet the demands of today's mass production and automation processes. Our pioneering effort and extensive background in this field is available to you.

**THE LAPOINTE MACHINE TOOL COMPANY**

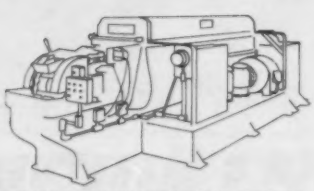
HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

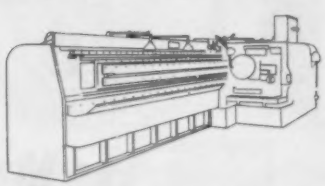
***Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE***



60" STROKE HORIZONTAL, ELECTRIC



CH CONTINUOUS BROACHING, ELECTRIC



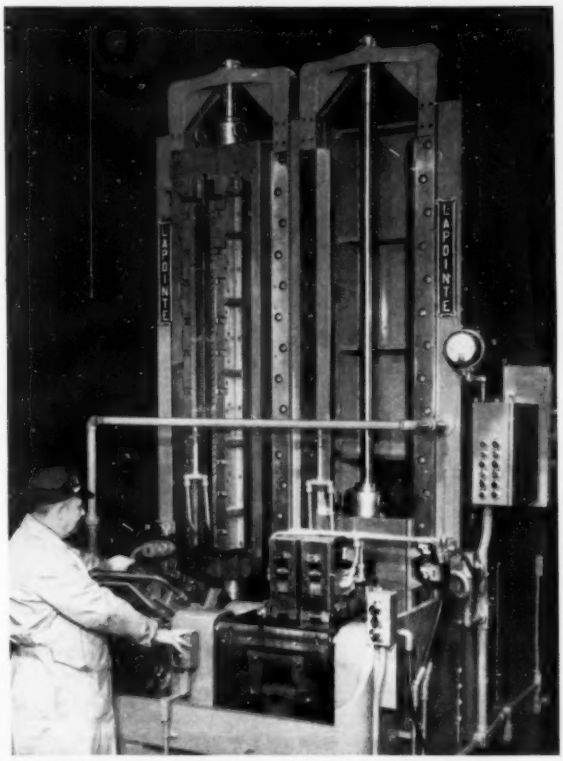
SRHE SINGLE RAM HORIZONTAL, ELECTRIC

# BOTTLENECKS

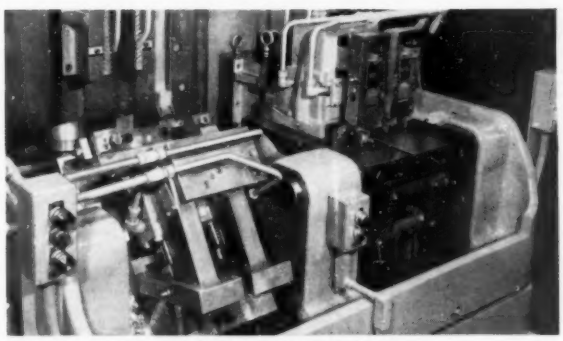
## BROACHING MACHINES

**LAPOINTE**

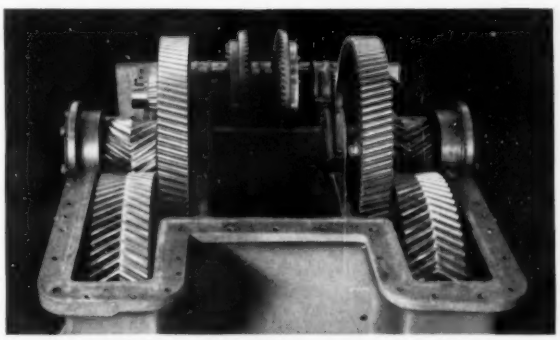
takes all the responsibility for your BROACHING program — we build the broaching **machines**, build the broaching **fixtures**, and make the **broaches!**



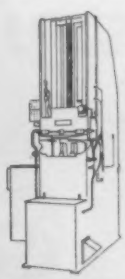

DOUBLE RAM VERTICAL, ELECTRO-MOTIVE DRIVE, LAPOINTE BROACHING MACHINE 40 hp. 70-inch Stroke, equipped with Lapointe-built Fixtures and Lapointe Broaches.



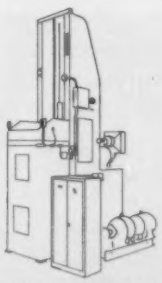
THE EFFICIENT, SAFE TIP-DOWN FIXTURES used on this machine for broaching an automotive front suspension arm are patented . . . and exclusive with Lapointe.



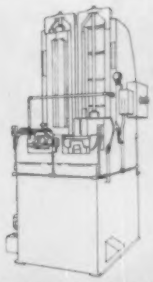
TRAIN OF HEAVY GEARS, for driving the broaches on the 40 hp., 70-inch Stroke, Double Ram Vertical Electro-motive Drive Lapointe Broaching Machine.



VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC



DRVE DOUBLE RAM VERTICAL, ELECTRIC

**LAPOINTE**

**BROACHING MACHINES**

# praise from Caesar...

The Salt Lake Tribune, Sunday, June 20, 1954
Here's the New McGee and Hogan
Radial Drilling Machine
With its 5-foot arm, this modern machine is capable of driving a 3" diameter drill to capacity through the center of a 10-foot diameter solid steel work piece. Also used for tapping and large boring operations, it is the only really modern radial of such dimensions in any intermountain machine shop doing repair work.
Veteran operator Pat Langford, above, finds the centralizing of all controls on this machine a big advantage over old-fashioned, scattered control points. Time saved means lower costs per job.
McGEE & HOGAN
MACHINE WORKS
1154 South 2nd West - Salt Lake City - 84-5291

When a customer of such outstanding caliber and recognized reputation as the McGee & Hogan Machine Works of Salt Lake City, Utah spends his own good money to tell the world how good his new "AMERICAN" Hole Wizard Radial is that's really "Praise from Caesar."

The accompanying McGee & Hogan advertisement appeared in the Sunday, June 20th, edition of The Salt Lake Tribune. It shows the new 5' 13" "AMERICAN" Hole Wizard Radial at work in their plant producing work for customers at "lower costs per job."

Lots of power, wide range, convenient controls and plenty of ruggedness are doing for McGee & Hogan Machine Works exactly what "AMERICAN" Hole Wizard Radials will do for you.

And Mr. Ray Hogan adds another punch to this testimonial by telling us in a recent letter, "Your machines are doing a wonderful job for us."

*Send for bulletin No. 327 and get the facts.*

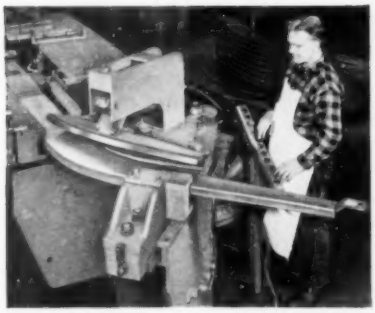
**THE AMERICAN TOOL WORKS CO.** **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills

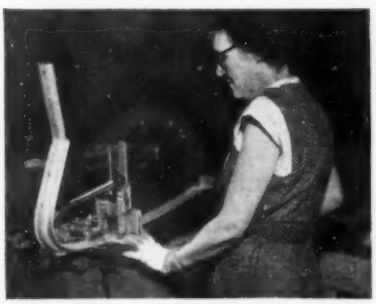
# HOW MAJOR INDUSTRIES NOW CUT *Product Costs*

See us at Booth 197—
ASTE EXPOSITION

1 AIRCRAFT TUBING—Smooth, extra sharp bends now produced in ultra-thin stainless steel tubing, saves space and $14,000 per plane for aircraft manufacturer. Shown above, Pines Size 4 Unit forming wrinkle-free 8" c/l radius bend in 4" x .050" S. S. tubing.



2 HOLLOW TRACTOR BOOMS—Cold bending 12 ga. welded steel tapered tubes without distortion on Size 4 Pines unit eliminates expensive blanking and forming dies, saves tons of material for farm equipment manufacturer.



3 EXTRUDED WINDOW FRAMES — Part of production line setup in large aluminum fabricating plant, this small Pines Semi-Automatic saves space, accurately bends automobile window frame moldings.

4 REFRIGERATION AIR CONDITIONING ELLS — Special Pines Automatic Cut-Off Benders now produce copper ells and return bends at speeds up to 1500 per hour, reduce scrap losses to 1%.

## with PINES PRODUCTION BENDERS

The examples shown here are a few of the countless number of production jobs that are now handled efficiently and more profitably on Pines Automatic Benders. They illustrate the versatility and the many cost-cutting advantages of cold forming round, square, rectangular, extruded, or hollow stock the "Pines-Way". Simplicity of tooling, uniform accuracy, and ease of operation are proven features of Pines machines which today help hundreds of plants cut product costs. At Pines you'll find an unmatched wealth of bending experience and creative tooling skill readily available to help you develop better methods and save time on production problems.

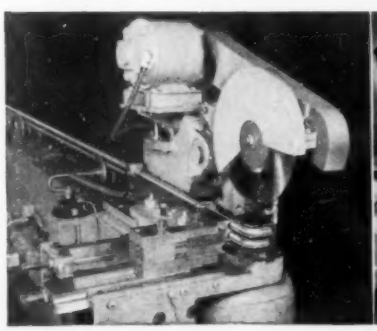
**Write for *Free* data sheets**

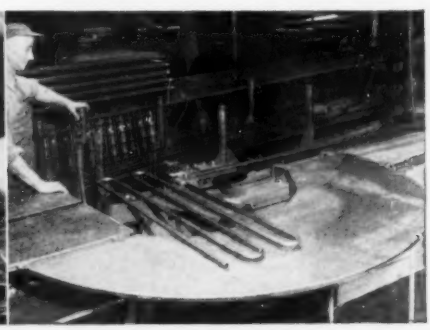
To keep abreast with latest developments in bending, write for copies of "Pines News" —bi-monthly mailing piece that gives facts on new, cost-cutting bending applications.

PINES ENGINEERING CO., INC.
Specialists in Tube Fabricating Machinery
693 WALNUT • AURORA, ILLINOIS

5 ENGINE MANIFOLD TUBES—Short 1½" O. D. steel tube now bent to 1½" c/l radius with flange attached saves space, insures accuracy, cuts costs.

6 BOILER TUBE AND REFRIGERATION COILS — Typical setup bending continuous serpentine coils from ¾" steel tubing. Reduces welding, fabricating costs. Other installations range from ¼" copper up to 3" steel tube.





MEET
THE MOST COMPLETE CUTTING TOOL LINE
MORSE CARBON TOOLS

# "MR. MORSE"

## . . . the biggest and fastest all-around man in the cutting tool industry . . . your Morse-Franchised Distributor

He's got the most complete line . . . the right cutting tools for every operation from the automated production lines of the biggest mass manufacturers, to the smallest job shop.

Carbon . . . high speed . . . tungsten carbide, tipped or solid . . . you name it and he's got it . . . *right now, when you want it! He can recommend the right tool for any job,* regardless of tool requirements. That's why Morse means "The Most" in Cutting Tools . . . because your Morse-Franchised Distributor can do *the most* for you . . . any time you call on him. So call on him today for any current requirements.

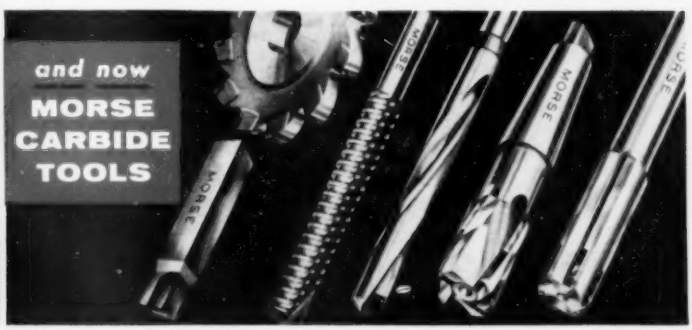
# MORSE means "THE MOST" in Cutting Tools

**MORSE TWIST DRILL & MACHINE COMPANY**
**NEW BEDFORD, MASSACHUSETTS**

*Subsidiary of VAN NORMAN INDUSTRIES, INC.*

*Warehouses in New York, Chicago, Detroit, Dallas, San Francisco*

*Buy them by phone from your Morse-Franchised Distributor and save ordering time*

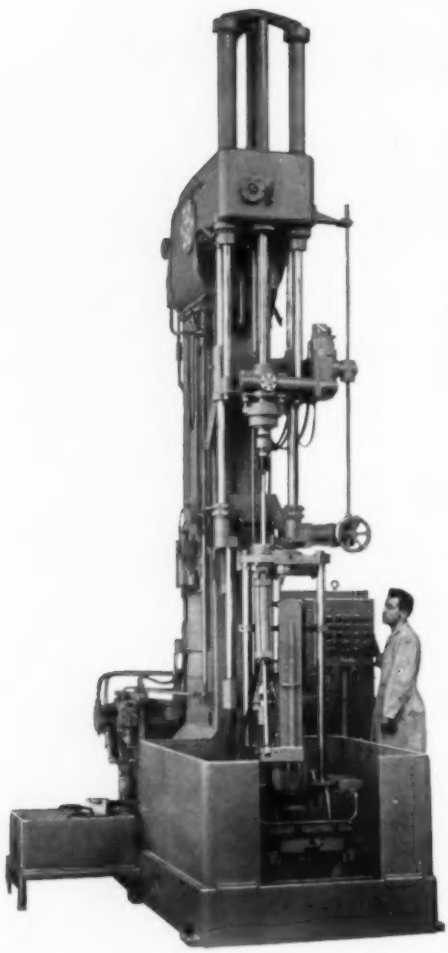





FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-3-27

# MICROHONING*...

## *Efficient Stock Removal*
with
## LOW-VELOCITY ABRADING



INCREASINGLY, process engineers are recognizing Microhoning's low-velocity abrading technique as a means of combining efficient stock removal with precision.

The Brooklyn Works of American Machine & Foundry Company, in the precision-manufacture of recoil mechanisms for artillery weapons, required a process that would most efficiently remove substantial amounts of stock and generate functional surface characteristics on the I.D. of recoil cylinders and O.D. of piston rods. After extensive study of available methods, AMF selected Microhoning as the most productive and economical process for obtaining desired results.

The floating piston in the recoil cylinder has nitrogen gas on one side and hydraulic oil on the other. Because silver ring seals are used, any error in geometry or roughness of cylinder or rod surfaces will induce deformation or scoring of silver rings and break these important seals.

The largest cylinder processed by AMF to date is for a 75 mm gun and has a bore diameter of 4.750 inches and a length of 46 inches. Piston rods for this gun are 1.375 inches in diameter and 56 inches long. Both I.D. and O.D. operations are on the same Microhoning machine—Model 450 Hydrohoner.

The Microhoning process efficiently removes up to .026 inch of stock from cylinders and .006 inch from rods to correct waviness, taper and out-of-roundness. A geometric tolerance of .0001 inch is held while obtaining a 1.5 microinch finish.

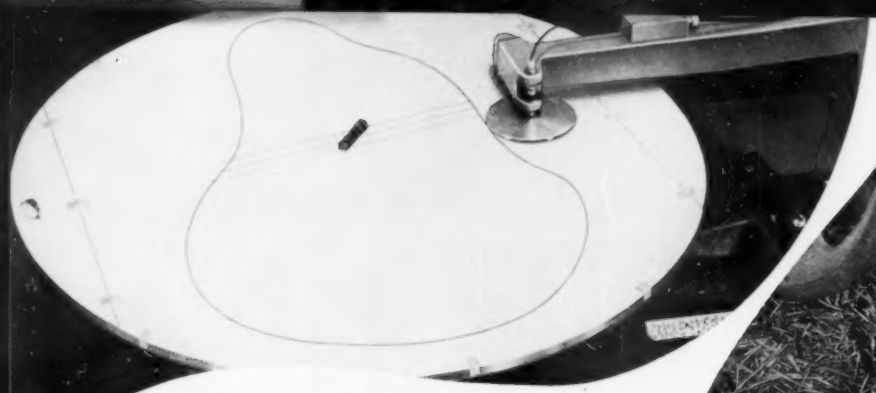
Working closely with AMF manufacturing personnel, Micromatic developed fixtures and tooling that minimize changeover time. The fixture for the cylinder is mounted on an indexing table so it is simply indexed away from the spindle while the rod is being Microhoned. You, too, can solve your precision stock-removal problems through application of Microhoning—the low-velocity abrading process.

*For further information write for CROSS-HATCH, Vol. 7 No. 5*

***MICROHONING=**
**Stock Removal + Geometry + Size Control + Surface Finish**

# MICROMATIC HONE CORPORATION

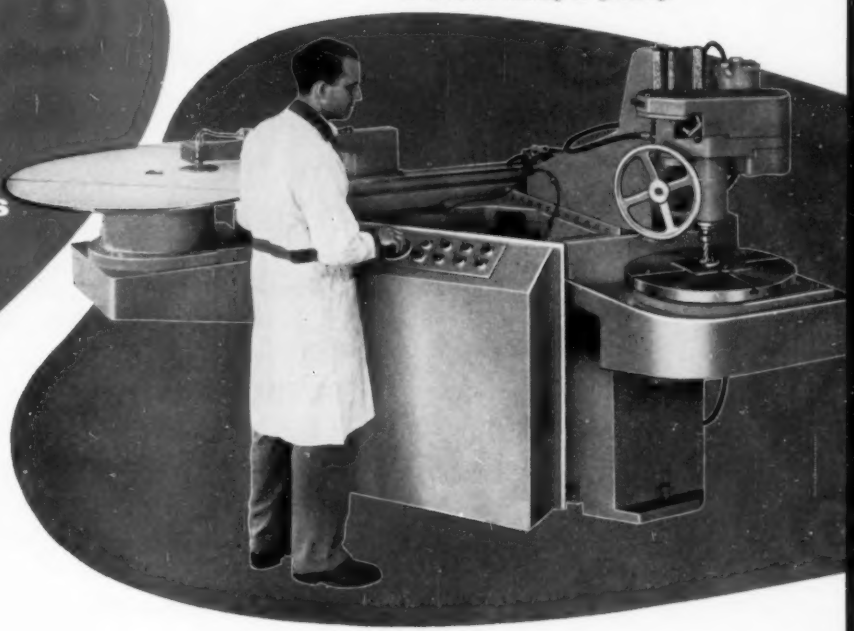
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN



Here, the non-contacting tracer follows the large-scale contour drawing easily prepared with electrically conductive "ink." For this job, a 10:1 drawing-to-workpiece reduction ratio is used, but any desired scale such as 20:1 or higher can be selected.

Following the action of the tracer, the cutter reproduces the exact shape of the drawing on the workpiece. Due to the selected reduction ratio, any errors in the drawing are reduced in the same proportion; resulting in accurate milling or grinding.

mill or grind
**IRREGULAR CONTOURS**
*without*
expensive models
*or*
complex
special tooling



- mill or grind directly from simple line drawings
- extremely accurate
- unique, non-contacting tracer control

## MODEL 104
## *Electronic* CAM and TEMPLATE MACHINE

If you are producing external or internal cams, templates, blanking punches or dies of complex, irregular shape, here are important opportunities for greater accuracy, shorter production times and lower costs than ever before possible! Send for your copy of Circular No. 579-1 fully describing the Model 104 Cam and Template Machine. Or, write to West Hartford on your Company letterhead outlining your requirements. Manufactured by the New England Machine & Tool Company. Sales representation by Pratt & Whitney.

**SEE THIS MACHINE AT THE A. S. T. E. SHOW.**
**NEW ENGLAND MACHINE & TOOL CO., BOOTH NO. 461**

**PRATT & WHITNEY COMPANY**
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16 Charter Oak Boulevard, West Hartford, Connecticut
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MACHINE TOOLS • GAGES • CUTTING TOOLS

# the TORK-LOK DESIGN...

## A New Approach to COLLET CHUCKING

PAT. APPLIED FOR

STYLE 1

STYLE 2

STYLE 3

**TORK-LOK DESIGN** . . . Inclined flats in both collet sleeve and arbor shaft.

**GREATER ACCURACY** . . . Because flat surfaces are in constant contact on both expansion and contraction.

**TORQUE TRANSMISSION** . . . Greatly increased by self energizing feature of precision mated flats.

**LESS COLLET BREAKAGE** . . . Built-in safety stops control both expansion and contraction.

**GEOMETRICALLY SEALED** . . . Metal-to-metal contact excludes foreign matter thus reducing wear.

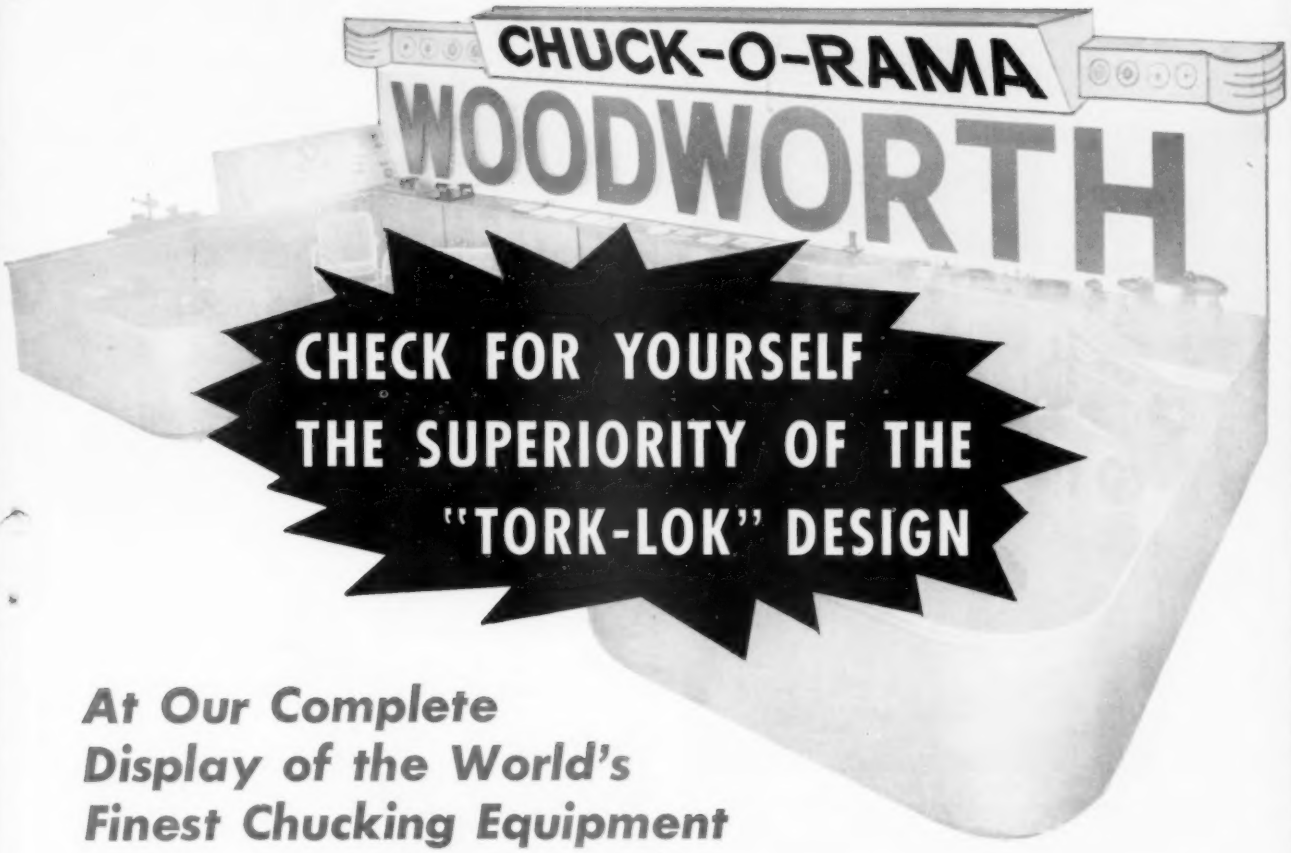
**SELF-RELEASING** . . . Preload feature assures easy part removal.

**CONCENTRICITY** . . . Locates straight or tapered holes on true center.

The "TORK-LOK" design of Collet Arbors is another Woodworth engineering triumph with . . .

*"Accuracy you can trust"*

# SEE IT AT...




**CHECK FOR YOURSELF THE SUPERIORITY OF THE "TORK-LOK" DESIGN**

*At Our Complete Display of the World's Finest Chucking Equipment*

## BOOTH 412

**A.S.T.E. EXPOSITION**
**INTERNATIONAL AMPHITHEATRE**
**CHICAGO • MARCH 19-23, 1956**

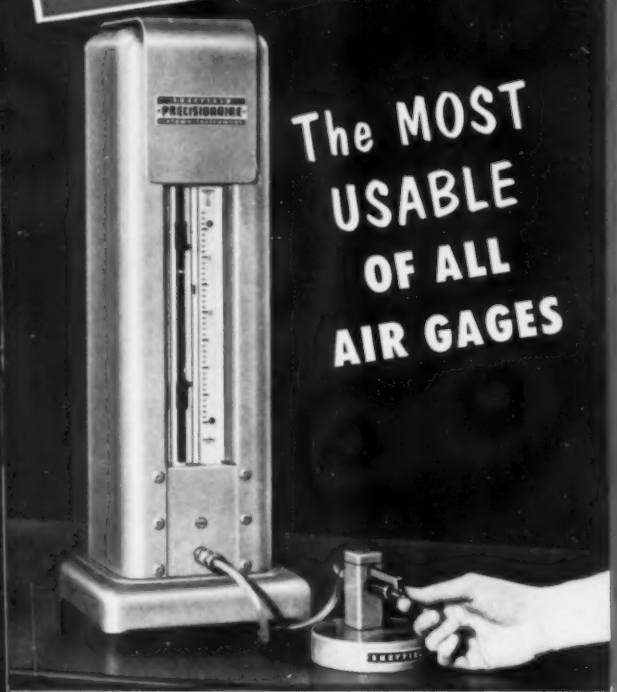
# WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD • DETROIT 20, MICHIGAN

PRECISION GAGES • CONE-LOK JIGS • DIAPHRAGM CHUCKS AND ARBORS • PRECISION PARTS
PRECISION INVESTMENT CASTINGS • PRECISION HEAT TREATING OF AIRCRAFT PARTS

# What You Can

## WITH SHEFFIELD'S PRECISIONAIRE




## The MOST USABLE OF ALL AIR GAGES

### CHARACTERISTICS

High precision with instant response

•

Has widest amplification range — 100 to 100,000-1

•

Accommodates widest tolerance range — .000005 to .100

•

Amplifications and tooling interchangeable

•

Provides quickest change in amplification

•

Longer scale facilitates classifying parts and provides greater approach range

•

Easier to read — no need to squat and squint

•

Human error minimized

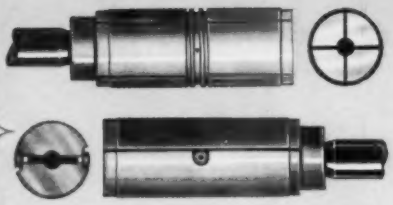
•

Checks one dimension or many simultaneously

•

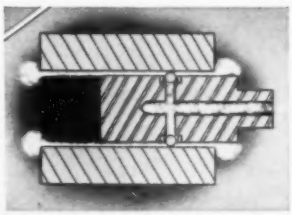
Elements have long service life

### BASIC INTERNAL TOOLING ELEMENTS

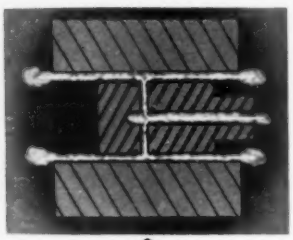


AIRJET SPINDLE

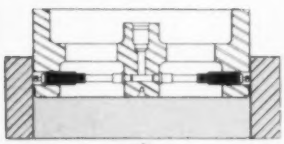
### For True Diameter



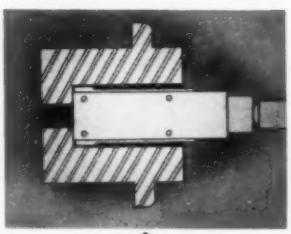
Balljet Spindles used for holes in porous or soft materials and for internal surfaces rougher than 65 rms.



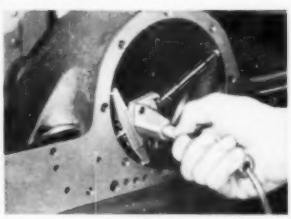
Standard stock spindle with two diametrically opposed open jets for holes having tolerances of .005″ or less and surface finishes of less than 65 rms.



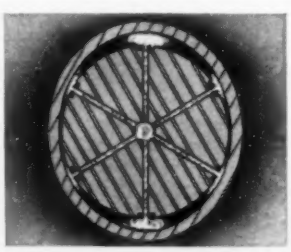
Plunjets mounted in a suitable fixture are used for larger holes and those having larger tolerances.



Bladejet Spindles are used in interrupted bores, bores having a keyway, to gage to the very bottom of a blind bore and for larger tolerance bores.



Adjustable spindles and kits are available to cover ranges of ⅜″ to ⅞″; ⅞″ to 1½″; 1″ to 3″; 1½″ to 3″ and 3″ to 12″.



### For Average Diameter

Spindles having three or more jets equally spaced around the perimeter—especially effective in checking thin wall components.

7210

MORE PRECISIONAIRES BOUGHT . . . . . .

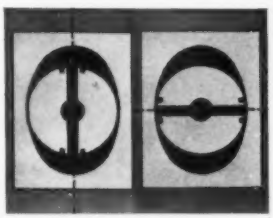
# Learn About Holes*

BALLJET SPINDLE

BLADEJET SPINDLE

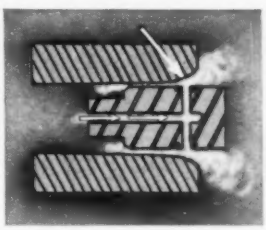
PLUNJET CARTRIDGES

## For Out-of-Round



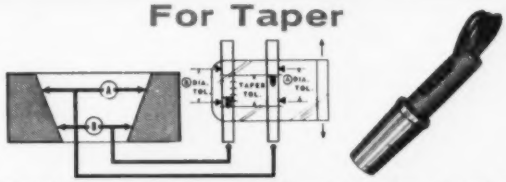
Indicated when any spindle is rotated through 90 degrees.

## For Bell-Mouth



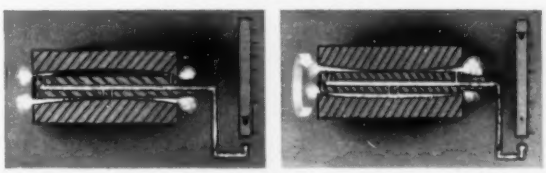
Indicated as any spindle enters or is withdrawn from the bore.

## For Taper



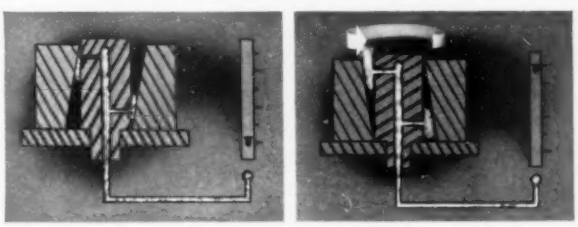
Indicated as any spindle is passed through the bore. Spindles having two or more sets of jets may also be used. In larger bores and/or those having larger tolerances, Plunjets in a suitable fixture are used.

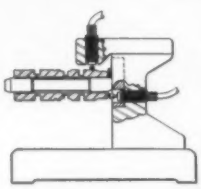
## For Camber



Camber or straightness of a hole is checked by rotating through 180° a spindle having four jets as indicated.

## For Squareness of a Bore Axis with a Face

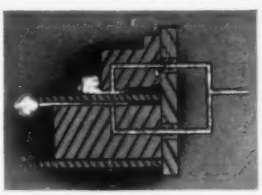




Spindle with opposed open orifices spaced longitudinally checks squareness of a bore axis with a face.

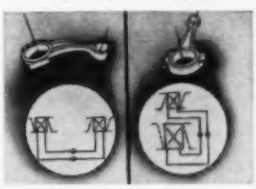
Plunjet fixtures may also be used.

## For Concentricity



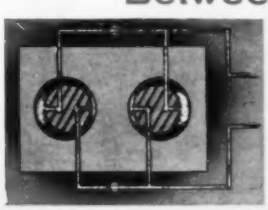
Opposed jets in a locating fixture.

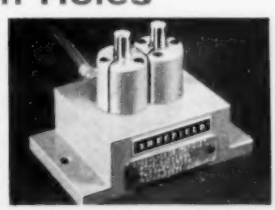
## For Parallelism of Holes



By integrating two spindles in a fixture, such as those used for squareness checking.

## For Center Distance Between Holes





By a fixture with two spindles each having two opposed jets.

*For checking external dimensions, relationships and countless other conditions, write to Div. 600, **THE SHEFFIELD CORPORATION, Dayton 1, Ohio, U.S.A.**

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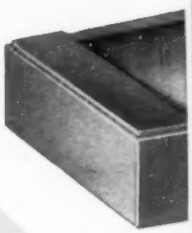
The New slot-free ram also eliminates the manual clamping of ram adjustment—a time saving feature.

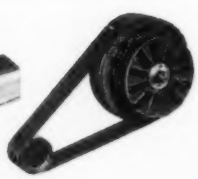
A speedy, dependable electro-magnetic brake and clutch insure a faster performance.

50 P.S.I. pressure lubrication, exclusive on Cincinnati Shapers, is a real insurance against wear and a guarantee of long trouble-free performance.

Write for the circular on the New Rigid Shapers.



Nodular iron, slot-free ram



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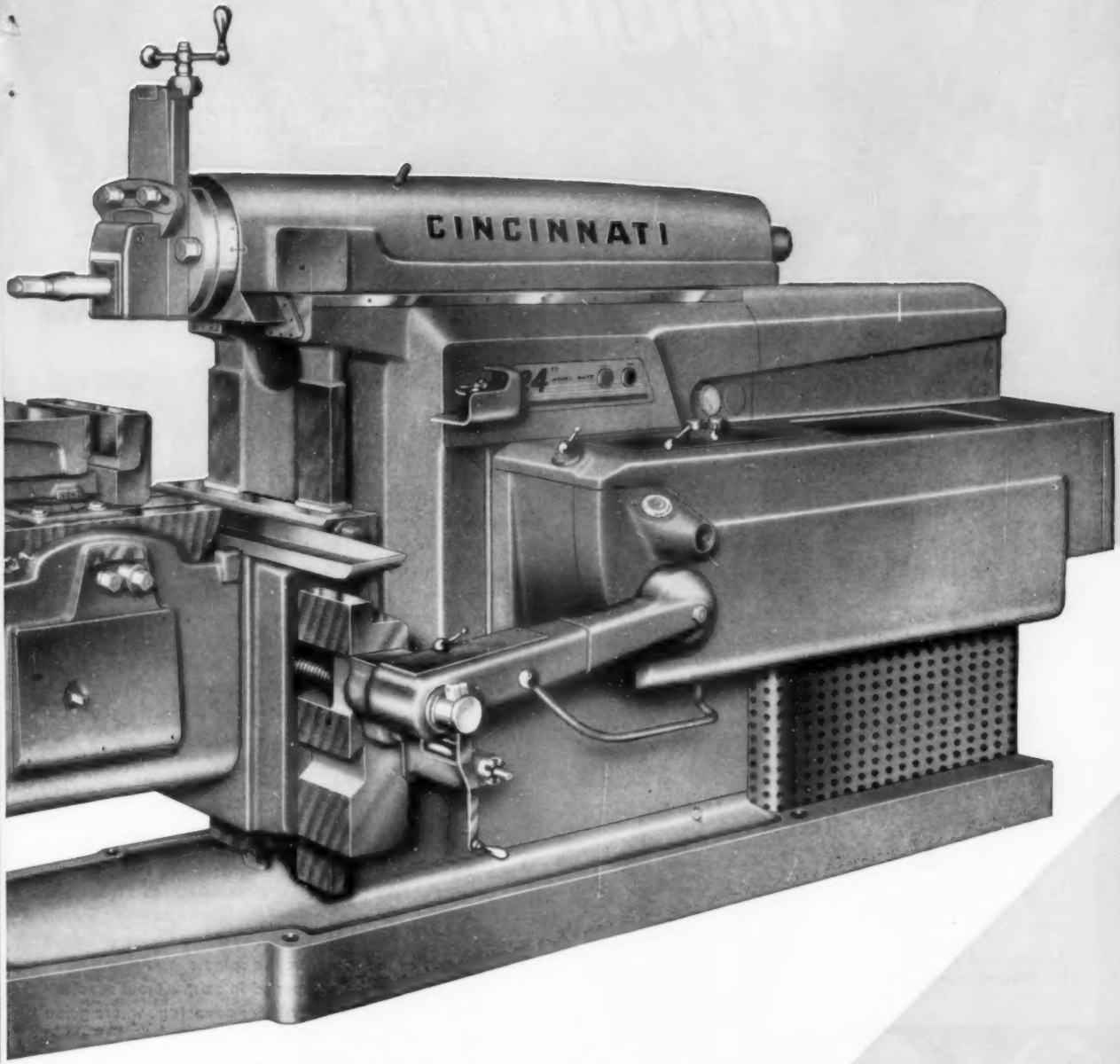


**Cincinnati Shapers, Shears and Press Brakes carry a 5 year guarantee on workmanship and material—write for details.**

# THE CINCINNATI SHAPER CO.

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CINCINNATI

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# announcing NEW METCUT Pin-Mount CORE DRILL

## Improved 2-Piece Design Provides Over 60% MORE SPACE *for Chip Removal*

This new METCUT Pin-Mount Core Drill is a tool you can depend upon for faster cutting action and longer, trouble-free service because the new design provides up to 60% more space for chip removal. The replaceable cutters in either carbide or high speed, are accurately positioned and driven by means of four pins, and are quickly and easily removed by a simple Allen head cap screw. No drifts are required. Gap between tool body and cutter section is also eliminated. Chip flow is smooth. There is no lodging or packing. Since drifting is no longer required, you eliminate the danger of damaging tools and spindles, insuring greater accuracy and tool life.

Patents Pending

Securely Held by Cap Screw. Quickly, easily removed by hand.

Accurate, Flush Fit — No Gap for Chips to Lodge or Pack

ORDINARY DESIGN — Secured by Shank and Socket

PIN-MOUNT DESIGN — Deeper flutes, over 60% greater space for chip disposal.

### *Sizes Available from 3/4" to 5"*

Of special importance is that now you can apply the advantages of the two-piece design to a wider variety of jobs. Small sizes as low as 3/4" are now available. Other sizes are provided in diameters up to 5". Furthermore, the new design will help you reduce setup costs because cutters can be easily removed without taking the body of the tool from the spindle. You replace cutters, which can be sharpened in sets, without readjusting spindles. This is of particular advantage where guide bushings and plates are used.

***Write* TODAY FOR COMPLETE DATA**

*Get the full story on the advantages of the new METCUT Pin-Mount Design. Write for new brochure and complete specifications.*

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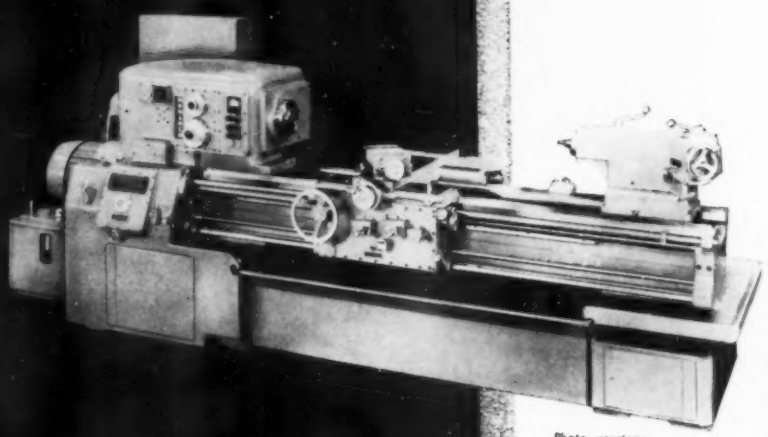

Photo courtesy
The Monarch
Machine Tool Co.

This is Monarch's Series 62 with Preselector Dyna-Shift designed to increase productivity and lengthen tool life. This fine lathe is typical of the quality machine tools built by Monarch. Write for Booklet #1505 for complete data. The Monarch Machine Tool Company, Sidney, Ohio.

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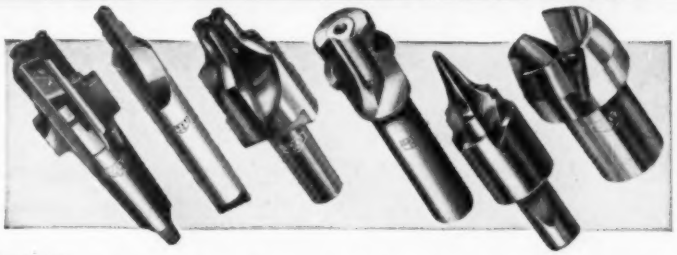


## Grip-Tip CENTERS with Replaceable Carbide Tips

(PATENTED)

CHECK
THESE
Grip-Tip FEATURES
● Long-Life Holders
● Replaceable Carbide Tips
● Easy Insertion and Removal of Male or Female Tips
● Reduced Machine Down-Time
● Lower Cost for Replacement of Carbide Tips
● Carbide Tips Accurate to .0003"
● No Regrinding of Holder
● Carbide Tips Are Easy and Inexpensive to Stock
● Reduced Regrinding Time
● Longer Diamond Wheel Life

Grip-Tip Centers are designed to substantially reduce your replacement costs and machine downtime for regrinding or replacement of worn or chipped centers.

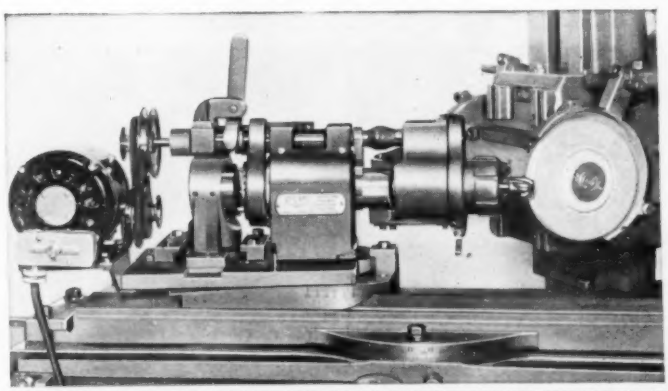
Male or female tips are inserted or removed from tool steel holders by simply turning clamping screw . . . you save replacement time.

The life of Grip-Tip holders is practically unlimited . . . only the tips are reground. Also, double end tips are relatively inexpensive . . . they reduce tool and inventory costs.

***It takes but a minute to remove and replace tips . . . machine tool downtime is less with Grip-Tip.***

## CIRCULARITY GRINDING ATTACHMENT

(Patented)



Circularity-Grinding Attachment illustrated permits your own tool makers to quickly and easily answer your production requirements for new cutting tools. With this attachment, new cutting tools can be quickly cut from raw stock, old tools converted to meet new requirements or standard tools reground to your specifications. The Circularity Grinder is of inestimable value when emergencies exist, demand for a new tool is urgent or production lines must be kept running. With this attachment in your shop you eliminate delayed deliveries.

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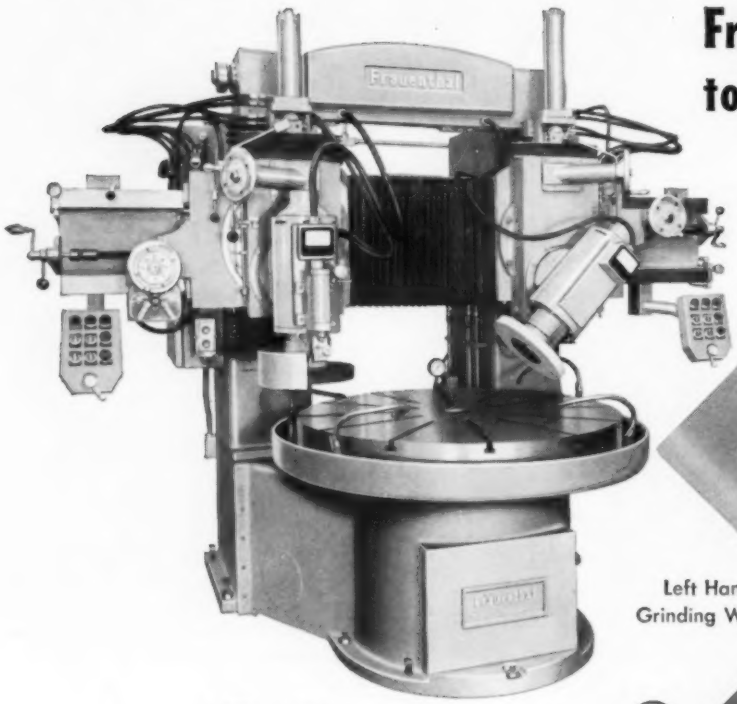
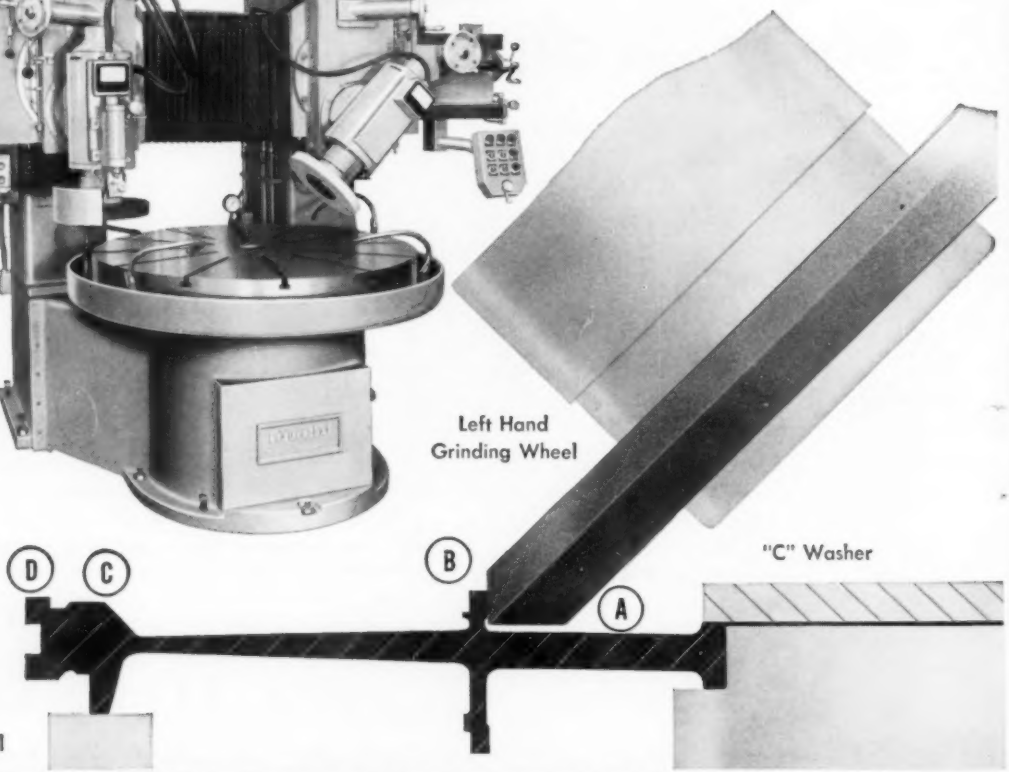
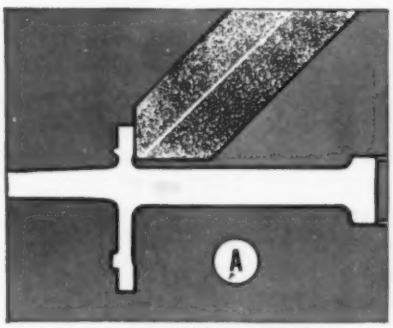
# Multiple Grinding Operations

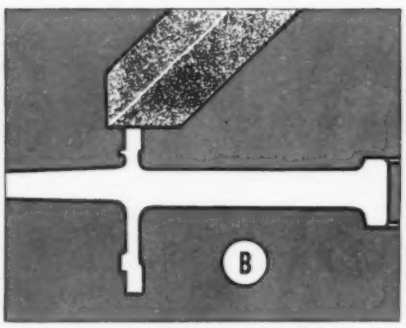
## Frauenthal 1800 Series tolerances . . . assures



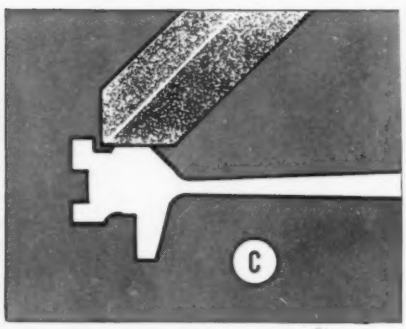



Jet engine part is set up on steel parallels and securely clamped to center pilot with large "C" washer.




Rigid mounting and proper alignment assures a high degree of accuracy in parallelism and roundness. Left hand




grinding wheel grinds one diameter and three related surfaces to extremely close tolerances.

# Frauenthal Division

# in One Set-Up

## Double Head machine finish grinds 6 surfaces to close concentricity of related surfaces...reduces grinding costs

As ILLUSTRATED in the schematic diagrams, three different diameters and three related surfaces of a jet engine component are precision-ground square and concentric with one another in a single setup using two grinding heads. This is a typical example of how a Frauenthal 1800 Series Double Head Grinder cuts grinding costs.

Frauenthal 1800 Series Grinders are available with four standard table sizes — 36″, 42″, 48″ and 52″ dia. with 60″ maximum swing. Specially engineered operating features or job accessories can be included to fit your requirements.

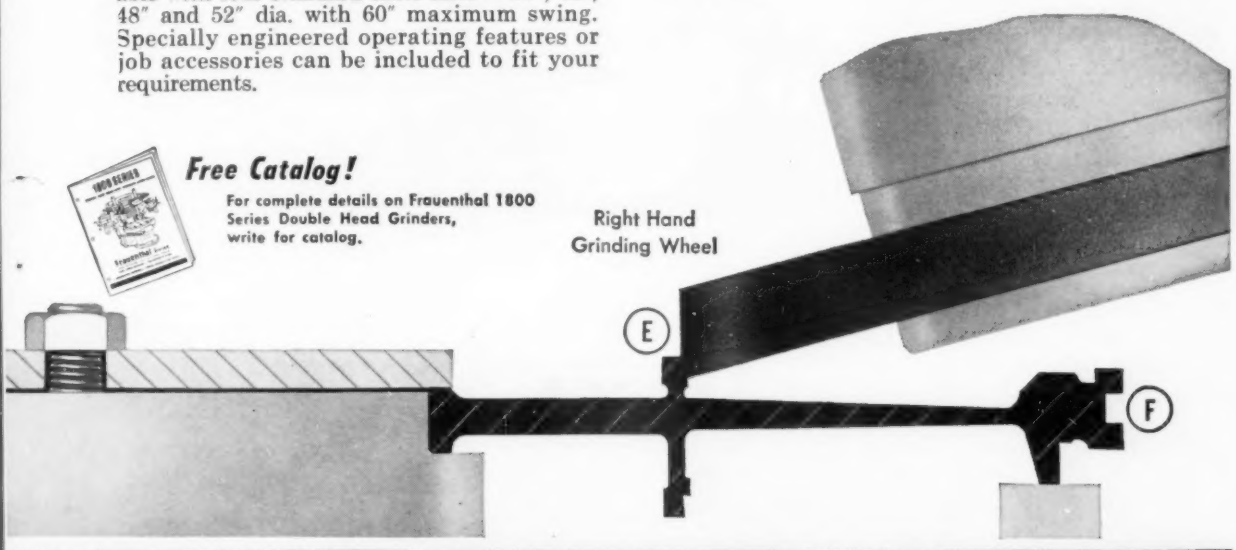
With Frauenthal Grinders (1800 Series or 2200 Series) you're able to grind a number of related surfaces (up to 140″ dia.) without changing setup of workpiece, and obtain accuracies within .000200″. This assures you *consistently* uniform precision in concentricity, parallelism and roundness.

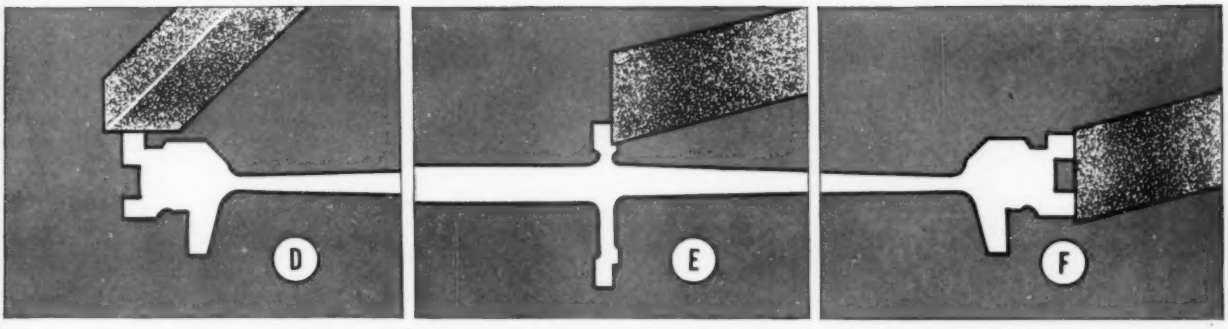
For complete details, contact Frauenthal of Muskegon.



***Free Catalog!***

**For complete details on Frauenthal 1800 Series Double Head Grinders, write for catalog.**




Starting from center of workpiece it finish grinds INNER diameter "A", and TOP FACES "B", "C" and "D". Right hand grinding wheel finishes OUTER diameters "E" and "F". Both spindles are swiveled for accessibility to the workpiece surfaces. All surfaces of jet engine part are ground within .000200″.

# THE KAYDON ENGINEERING CORP.

## MUSKEGON, MICHIGAN

# NOW

## MEET THE CHALLENGE OF THE FUTURE WITH SIDNEY HEAVY-DUTY LATHES

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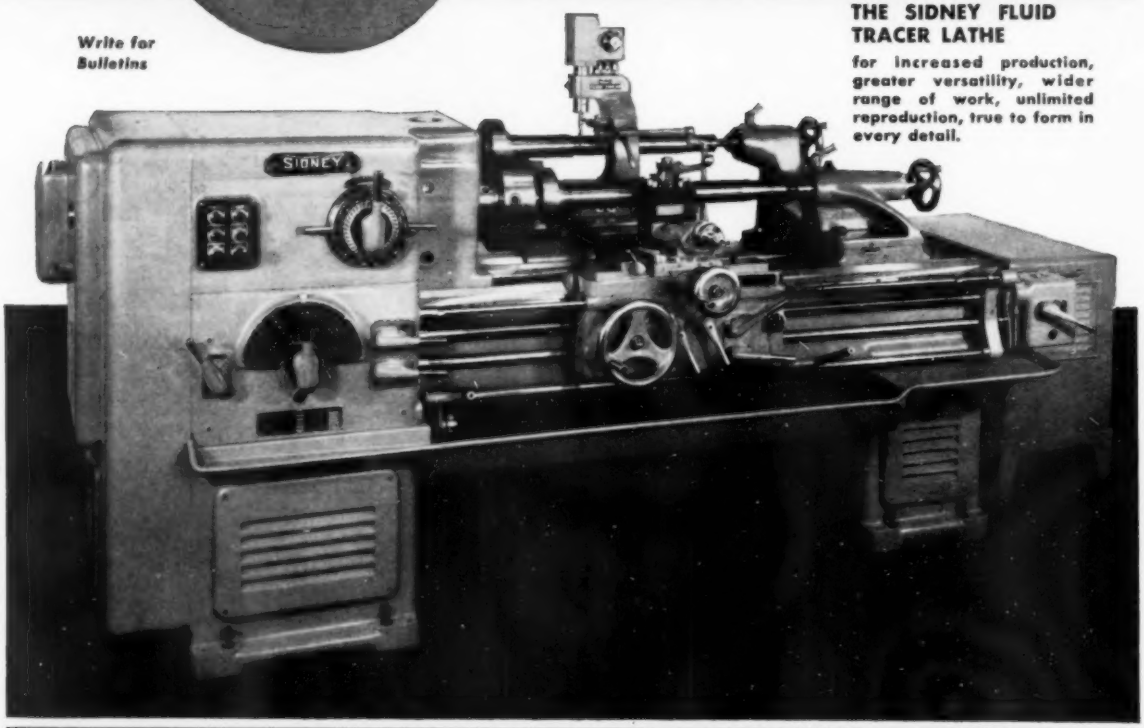
**NOW** . . plan to replace obsolete equipment with **SIDNEY HEAVY-DUTY LATHES**

**NOW** . . learn the economies in costs of production

*Write for Bulletins*

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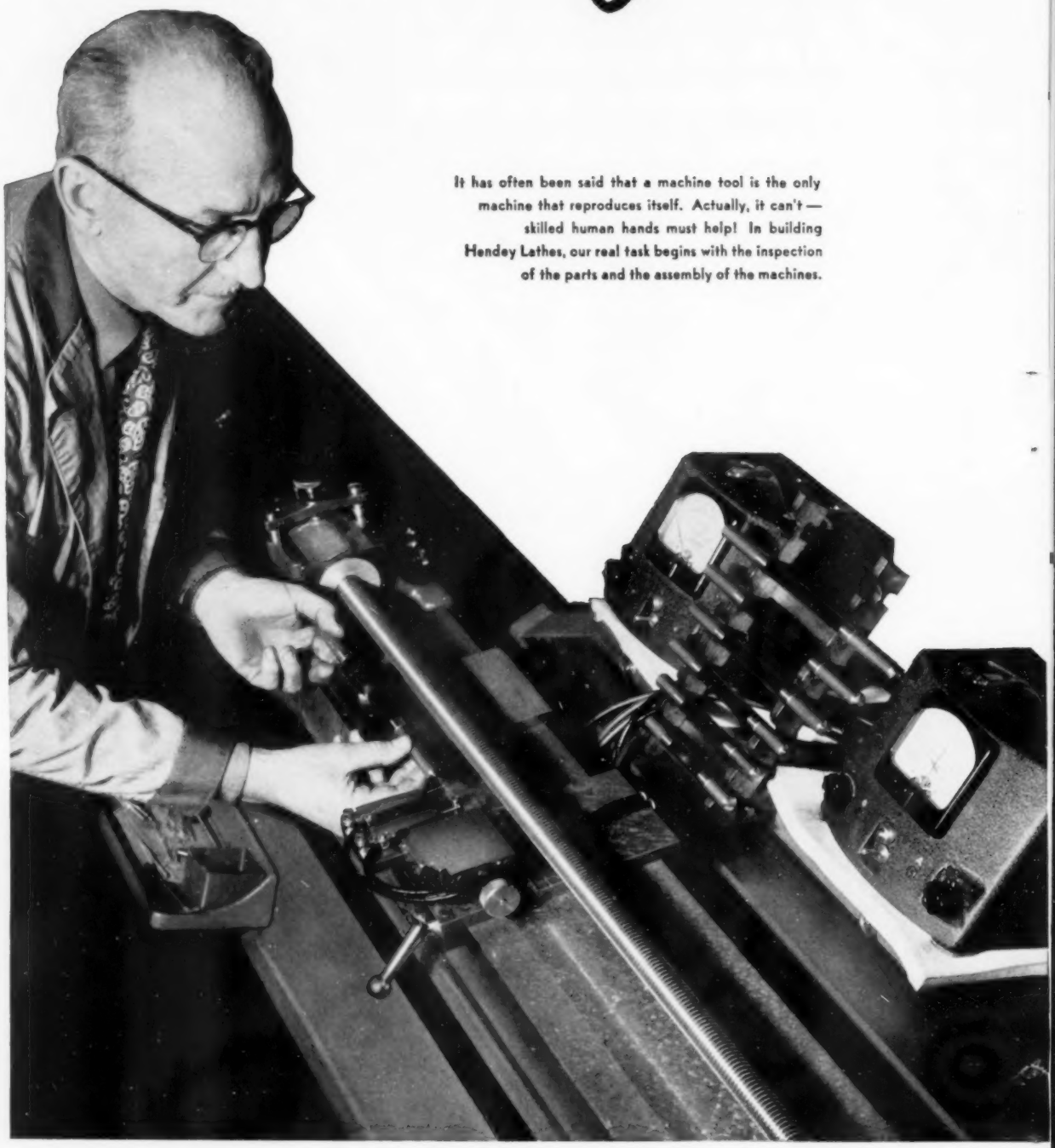
# Something more



It has often been said that a machine tool is the only machine that reproduces itself. Actually, it can't — skilled human hands must help! In building Hendey Lathes, our real task begins with the inspection of the parts and the assembly of the machines.

# *than tolerances...*

**creates the enduring accuracy built into**

**every *Hendey* Lathe!**

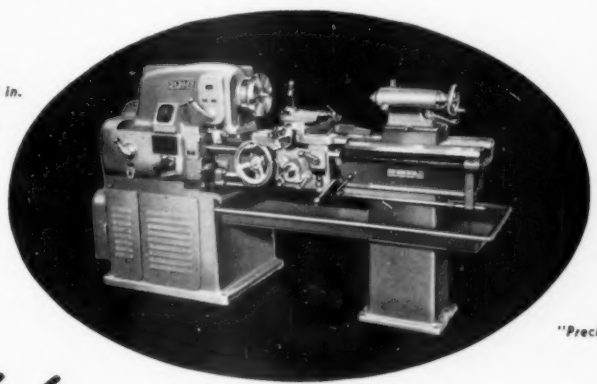
At the left you see one of our inspectors carefully checking a Hendey lead screw, assuring that it is within the prescribed tolerances. Every lead screw is cut to closest possible tolerances, and inspected with an electronic lead checker.

Every inch of every lead screw is checked with measuring rods and the special device shown. Two electronic gauges are used in this inspection — one to measure errors to within .0001 in., and the other to assure the operator that his setup remains the same from test to test. This method of inspection, re-enforced by the operator's desire for perfection, insures that lead screws are well within the lead tolerance over their entire length.

Our Model 2E General Purpose Lathe offers a fast, accurate method for cutting threads, as well as performing a variety of other toolroom operations. With a single, three-position lever on the apron, you can control the sequence of operations in thread cutting — starting, stopping, and reversing the tool through the thread without crossing it. For longer threads, half nuts and the thread chasing dial can be used.

For other operations, the Model 2E Electronic Drive gives you infinitely variable spindle speeds from 15 to 1500 rpm. On facing cuts, stepped diameters, and tapers, the operator can change speeds during the cut, selecting the correct rpm on the control rheostat. The belt drive provides smooth vibration-free power to the spindle for extra-fine finishes, and back gears are provided for heavier cuts. These and other Hendey features mean easier, low-cost production and faster "pay-off" on your investment. Write your Hendey dealer for complete facts!

*Hendey No. 2E 14 in. General Purpose Lathe*



*"Precision with Production"*

***Hendey*** **machine division**

**BARBER-COLMAN COMPANY**

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DRILL PRESSES:
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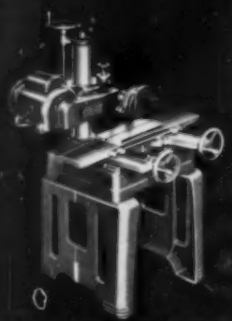
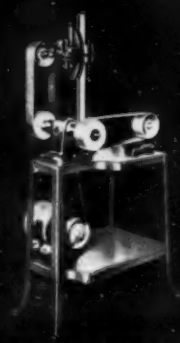
TOOL GRINDERS: 7" Standard Grinder, 6" Carbide Grinder

CUT-OFF MACHINES: Wet Abrasive, Dry Abrasive, Non-Ferrous Metal, Wood



GRINDERS: Toolmaker Grinder, Standard Surface Grinder, Chip-Breaker Grinder, Tool & Cutter Grinder

11" METAL CUTTING LATHES:
Five-foot Bed, Four-foot Bed



BELT GRINDERS: 2½"

BAND SAWS: 14",
8-Speed Metal-Wood

## DELTA QUALITY COSTS NO MORE

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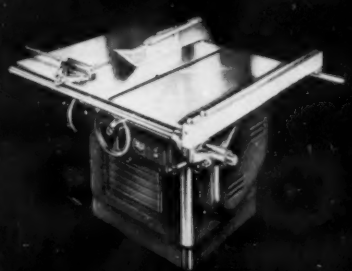
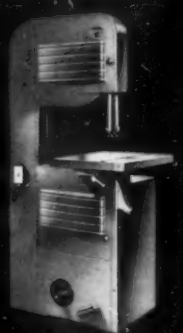
## For Woodworking

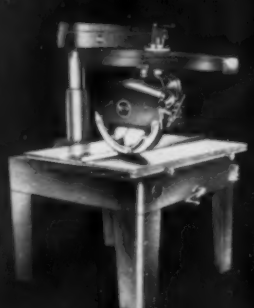
SHAPER:
Industrial and Bench



CIRCULAR SAWS:
12", 10" Tilting Arbor; 10" T.A. Bench

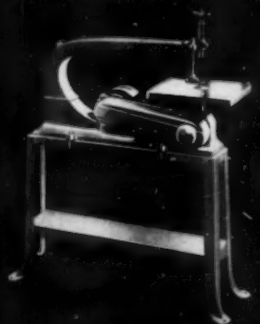


BAND SAWS:
20", 14"

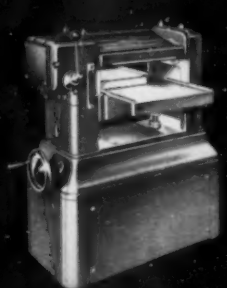


RADIAL SAWS:
20", 14", 10", 9"

JOINTERS:
8", 6" Long Bed



SCROLL SAW: 24"



PLANER: 13" x 5"

ROCKWELL-BUILT

# DELTA power tools

**World's most complete, most versatile, most useful line of metalworking and woodworking power tools**

**53 Machines...246 Models...Over 1300 Accessories**

# SAVE MONEY

...**In Production:** Thousands of plants, large and small, are cutting costs by using accurate, rugged, inexpensive Delta Power Tools to supplement and often replace—heavy, expensive conventional machines. *You* can, too.

...**In Maintenance:** Portable, accurate Delta Power Tools pay for themselves by enabling your own men to handle even the most exacting jobs better, faster, without expensive outside help.

...**In Crating:** Delta Power Tools put production-line efficiency into your shipping room—make possible more output in less time, with less waste.

...**In Every Shop,** large or small—in *your* shop—Delta Power Tools can save on initial investment, on maintenance, on replacement. Get all the facts about Delta Power Tool savings, *then make up your own mind!* Your Delta Dealer is listed under "TOOLS" in the yellow pages of your phone book.

***Send for all The Facts NOW!***

DELTA ROCKWELL

**DELTA** QUALITY POWER TOOLS

Another Product by **Rockwell**

**Delta Power Tool Division, Rockwell Manufacturing Co.**
**620C N. Lexington Avenue, Pittsburgh 8, Pa.**

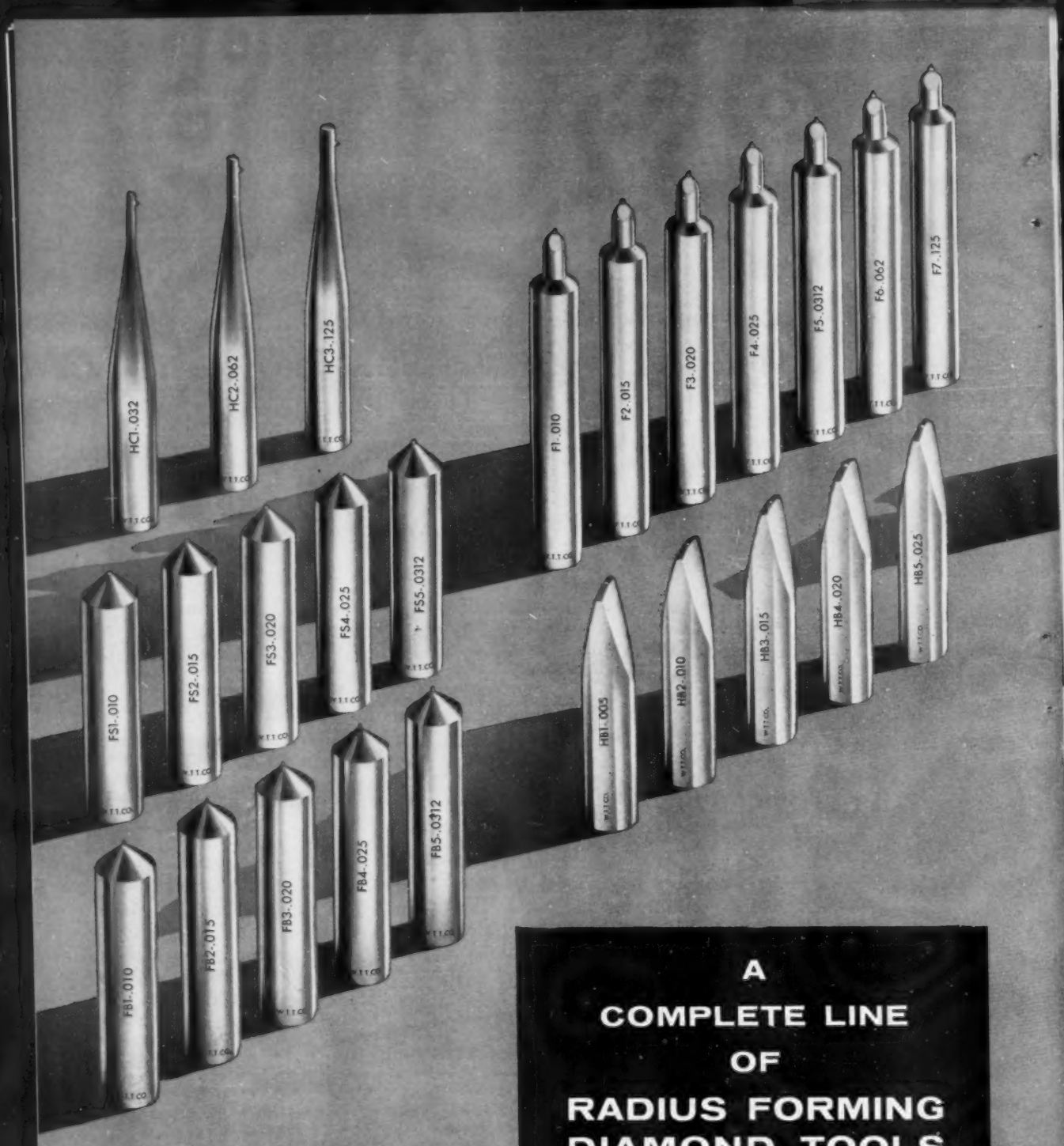
- ☐ Send fact book on using Delta Power Tools teamed with Machine Tools.
- ☐ Send complete Delta Industrial Catalog.
- ☐ Send name of my nearest Delta Dealer.

Name_____ Title_____

Company_____

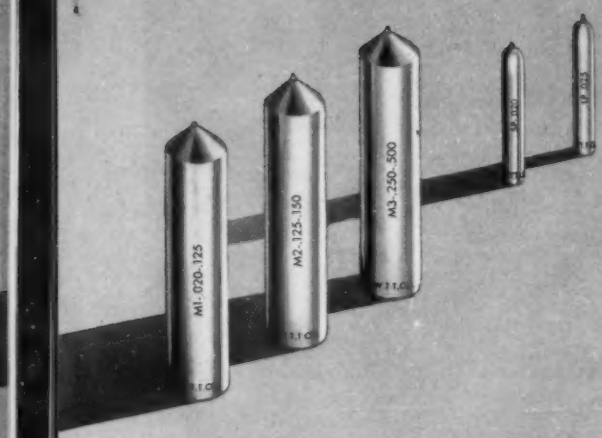
Address_____

City_____ County_____ State_____




# A COMPLETE LINE OF RADIUS FORMING DIAMOND TOOLS

**Engineered to the job**
**Guaranteed to do it**



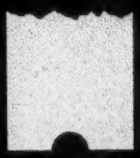

THERE are only three types and positions of radii in seven contours shown at the right, yet, in order that these may be formed quickly and accurately on any type of dresser, our standard line of radius forming diamond tools includes all of the 30 illustrated here and many more.

Why is it necessary to have so many tools? Simply because diamonds vary in size, shape and hardness and no one diamond will dress all radii. So, we have developed these various tools to take the particular diamonds that will do each job best.

The diamonds are especially selected, of course, and an almost incredible amount of care is used in setting them in the shanks so that the diamond is perfectly concentric with the shank, so that the best cutting edge is to the work and, in the case of lapped and shaped diamonds, so that the exposed shape is absolutely accurate.

These Radius Forming Diamond Tools are but one of the many kinds of Engineered Diamond Tools developed in our laboratories and through our field work during 45 years of specialization in diamonds and diamond tools. We'll gladly send literature.

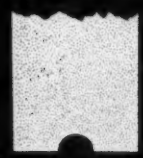
**WHEEL TRUEING TOOL COMPANY**
81-3200 W. DAVISON AVE., DETROIT 38, MICHIGAN
*ESTABLISHED 1910*
Southwestern Plant: Dallas, Texas
*Distributors in Principal U.S. Cities—Agents Throughout the World*
WHEEL TRUEING TOOL COMPANY OF NEW JERSEY
33 West Street, Bloomfield, N. J.
WHEEL TRUEING TOOL COMPANY OF CALIFORNIA
5560 Alhambra Ave., Los Angeles 32, California
WHEEL TRUEING TOOL COMPANY OF CANADA, LTD.
575 Langlois Ave., Windsor, Ont.



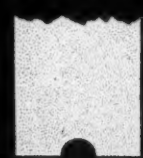
**Series HC**
For half-circle radius
.032" to .125"

**Series F**
For concave radius
.010" to .125"

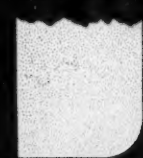
**Series FS**
Formed Diamond
For 88° to 99° included angle
.010" to .0312" radii



**Series HB**
Formed Diamond
Half Ball Type
.005" to .020" radii



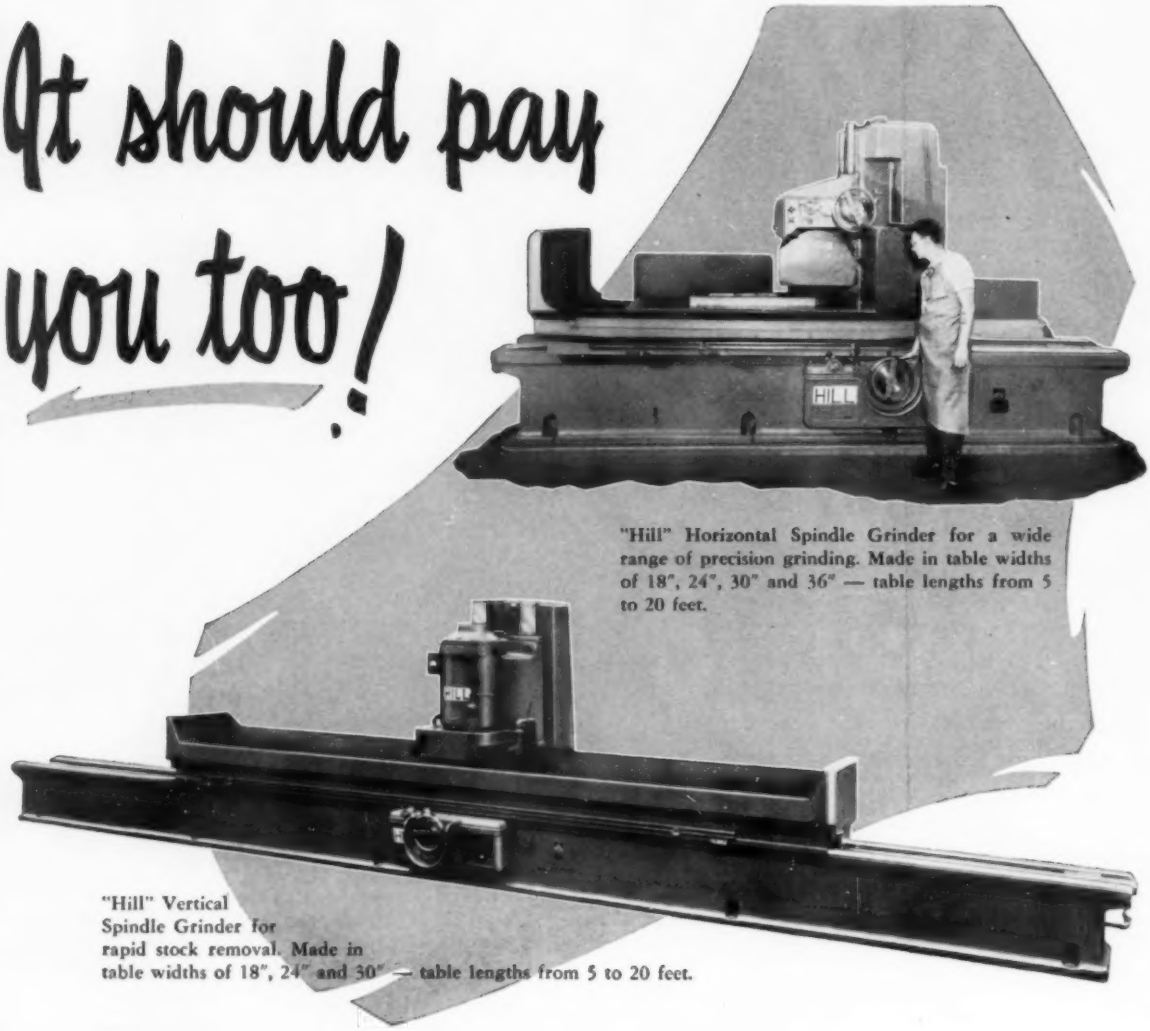
**Series FB**
Formed Diamond
Ball Type for 180° radius
.010" to .0312" radii



**Series M**
For convex radius
.020" to .500"

**Series SP**
For small concave radii
.020" to .025"

# It should pay you too!




"Hill" Horizontal Spindle Grinder for a wide range of precision grinding. Made in table widths of 18", 24", 30" and 36" — table lengths from 5 to 20 feet.

"Hill" Vertical Spindle Grinder for rapid stock removal. Made in table widths of 18", 24" and 30" — table lengths from 5 to 20 feet.

Every manufacturer of heavy duty precision surface grinding equipment has:

- √ **Testimonials from satisfied users.**
- √ **Records of fine finishes produced.**
- √ **Case histories of phenominal savings over other finishing methods.**

But there are other important factors that should be considered:

- √ **Maximum accessibility and control simplicity.**
- √ **Minimum maintenance over the years.**
- √ **Longer accurate production life due to proven design methods, rigid construction and vibration-free operation.**

It has always paid the users of HILL Open Side Hydraulic Surface Grinders. It should pay you too!

***Look for the added considerations before you buy!***

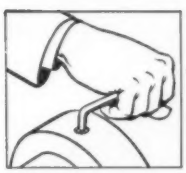
## THE HILL ACME COMPANY

**1209 WEST 65th STREET • • • CLEVELAND 2, OHIO**

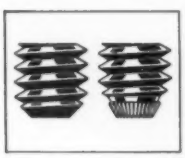
**"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING • THREADING TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES**

# Greater resistance to removal holds Allenpoints tighter in your products

## Tests prove that ALLENPOINT Set Screws have 50% HIGHER WITHDRAWAL TORQUE than serrated point set screws



**HIGHER WITHDRAWAL TORQUE WITH ALLENPOINTS!** In ¼" x ¼" sizes, tightened to shear point of key, Allenpoints required 75 inch-pounds removal torque. Serrated point set screws gave up their hold at only 50 inch-pounds removal torque.



**ONE MORE FULL THREAD WITH ALLENPOINTS!** Compare, and you'll find that Allenpoints have *one more full thread* than same size serrated point set screws. That means greater holding power, especially in the much-used "square" sizes.

**DEEPER, CLEANER SOCKETS WITH ALLENPOINTS!** Allenpoint sockets are *"pressur-formd"* to preserve the long fibers of the steel uncut throughout the *entire* length of the screw. This makes a deep socket of maximum strength, in which the key seats with great exactness.

**Specify ALLENPOINTS** for far greater *holding* power — the kind of fastenings that "stay put". Genuine Allenpoints and other Allen fasteners are available from your Industrial Distributor — standard items immediately, special items very promptly. Write for full information.

You want maximum holding power from every set screw in your product. Here's why you'll get that from ALLENPOINT ○ Set Screws: Allenpoints and serrated point set screws were recently compared in laboratory tests. They were the kind of tests you'd make in your own plant — random samples of each were chosen from regular stock boxes from distributors' shelves.

In each test, keys were tightened right up to the shear point — maximum tightening point for any set screw. In each test, 50% HIGHER WITHDRAWAL TORQUE was required to release the ALLENPOINT ○ Set Screws.

Translated into your own product, this means more dependable fastening with ALLENPOINTS.

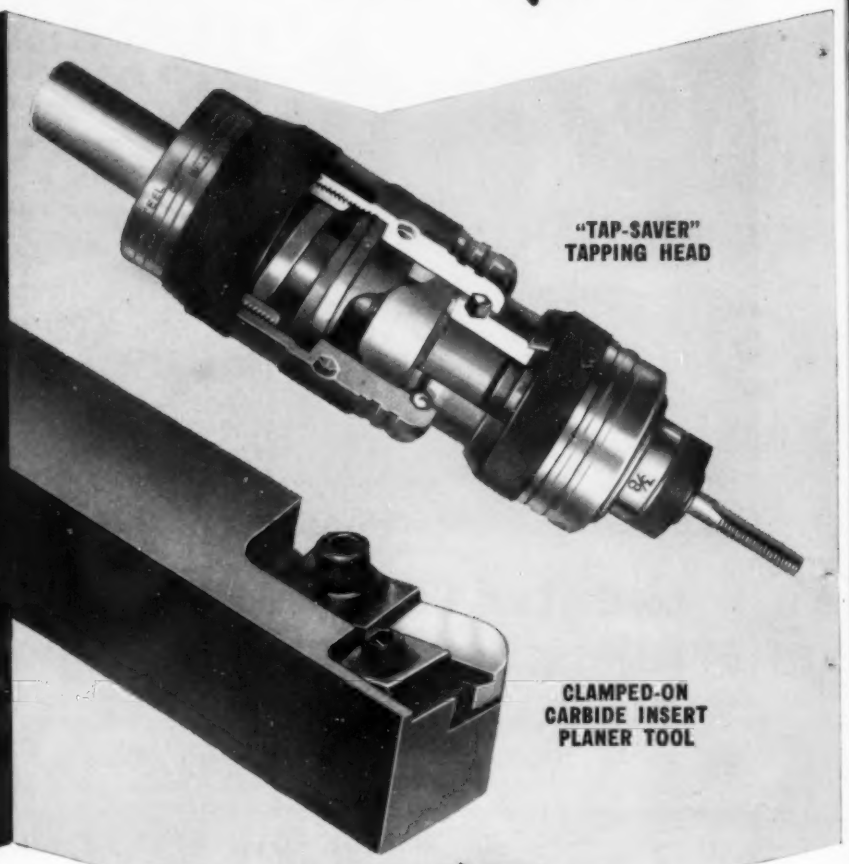
# You're Invited to Inspect..

## at the A.S.T.E. Industrial Exposition

March 19-23

INTERNATIONAL AMPITHEATRE

CHICAGO, ILLINOIS



"TAP-SAVER" TAPPING HEAD

CLAMPED-ON CARBIDE INSERT PLANER TOOL

**You won't want to miss these important new standard tool developments on display in the Davis booth.**

### "TAP-SAVER" TAPPING HEAD

**Virtual elimination of tool breakage is assured by the new Davis Tapping Head which provides sure, easy adjustment of slippage to accommodate a wide variety of materials. Quick-change collets automatically vary torque for different size tools and permit tapping, boring, counter boring, spot facing, drilling and reaming with the same head.**

### CLAMPED-ON CARBIDE INSERT PLANER TOOLS

**Providing full support and back up for the insert—plus specially-engineered cutting angles—the new Davis Clamped-On Carbide Insert Planer Tools permit table speeds in excess of 400 fpm on cast iron and steel. They not only improve surface finish at maximum feeds and depths of cut, but more than double tool life between grinds, as well.**

*new!* SPECIAL FEATURE ITEMS

# . . . the ONE COMPLETE Tool Line

BLOCK-TYPE GENERAL PURPOSE BARS
PRECISION LINE BORING BARS
SUPER MICROMETER ADJUSTABLE FLYCUTTER TOOLS
SUPER MICROMETER ADJUSTABLE TOOLS WITH UNFINISHED SHANKS
L-TYPE MICROMETER EXPANSION BORING TOOLS
CLAMPED-ON CARBIDE TIP PLANER TOOLS
QUICK-CHANGE AND MORSE TAPER ARBORS AND SLEEVES
MICROMETER EXTENSION AND THREE-AND-ONE BORING HEADS
INTERCHANGEABLE BLOCK-TYPE TOOLING
SUPER MICROMETER ADJUSTABLE STUB BORING TOOL SETS

Yes, one look at Davis and you're sure to agree that here is industry's most complete standard tool line. One quick check of its unparalleled range of types, sizes and cutter materials will convince you that only Davis offers the full advantages of one-source buying for all your boring, turning and planing requirements.

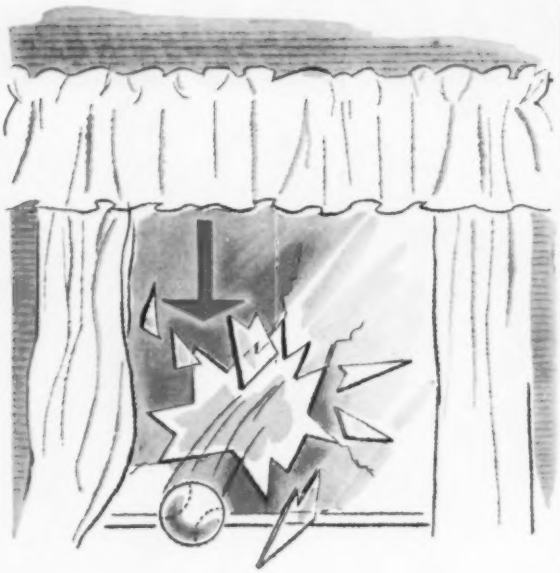
Here, too, at Davis you'll see designs from the one engineering group with the vision and background of metal working experience to produce special tooling of outstanding efficiency. So whatever your needs . . . at the show and in the shop . . . it's always good advice to see Davis first for the best in tooling.

**DAVIS**

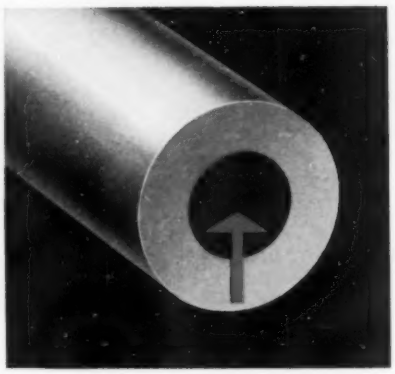
**BORING TOOL DIVISION OF**
**Giddings & Lewis Machine Tool Company**
**Fond du Lac, Wisconsin**

**Booth 489** CHICAGO'S INTERNATIONAL AMPITHEATRE

**THE ONE NAME THAT CERTIFIES ULTIMATE PRECISION AND PRODUCTIVITY IN TOOLING**



a hole here means work...



a hole here saves work

***Crucible Hollow Tool Steel Bars*** take much of the work out of making ring-shaped steel parts, or tools with a center hole. The hole's already there. You save expensive drilling, boring, cutting-off and rough-facing operations . . . you reduce machine time and scrap losses.

You can now get Crucible Hollow Tool Steel Bars in any of the famous Crucible tool steel grades, in virtually any I.D. and O.D. combination. And you can get *immediate delivery* from stock of the five most useful grades — KETOS oil-hardening . . . SANDERSON water-hardening . . . AIRDI 150 high-carbon, high-chromium . . . AIRKOOL air-hardening . . . NU DIE V hot-work tool steels.

Your Crucible representative can quickly show you how Crucible Hollow Tool Steel Bars will save you work and money. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

**CRUCIBLE** first name in special purpose steels

**Crucible Steel Company of America**

*This Month's*

# GEAR PIX

**OVER TWO MILLION** rear axle shaft splines have been cold formed in a large automotive plant on a battery of three automatic Roto-Flo spline rollers. Production rate for the 28-tooth, 24/48 diametral pitch splines is 270 per hour on each machine. Tool life is about 150,000 parts per grind.

**DOZENS OF AUTOMATIC** gear classifiers are now being built by Michigan Tool for 100% inspection control on gears that are being hobbed or shaved. Probe type 3-WAY gear classifiers shown here are in great demand due to freedom from stray chip interference, simplicity of operation and ease of adjustment.

**MICHIGAN TOOL COMPANY**

7171 E. McNICHOLS RD. • DETROIT 12, MICH.

*IN CANADA: COLONIAL TOOL CO., LTD.*

*This Month's*

# GEAR PIX

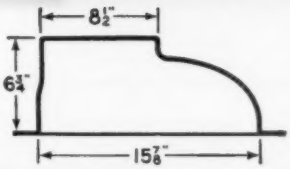
**VERSATILE SHEAR-SPEED** gear shaper shown here cuts 32 different parts for lift truck transmissions and hoists. Production time is reduced as much as 78%, changeover time is about the same as previous methods. Shown are some of the 32 gears, ratchets, sprockets and splines ranging up to 7 inches in diameter, that are being cut. Parts produced per tool sharpening range from 172 to 1200.

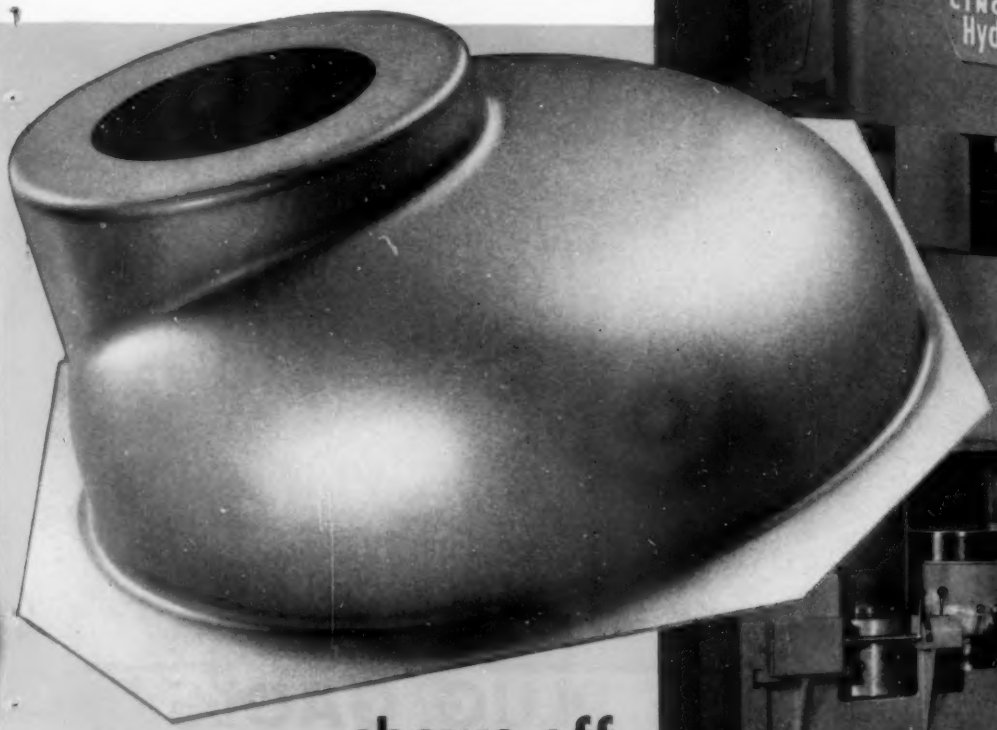
**MICHIGAN TOOL COMPANY**

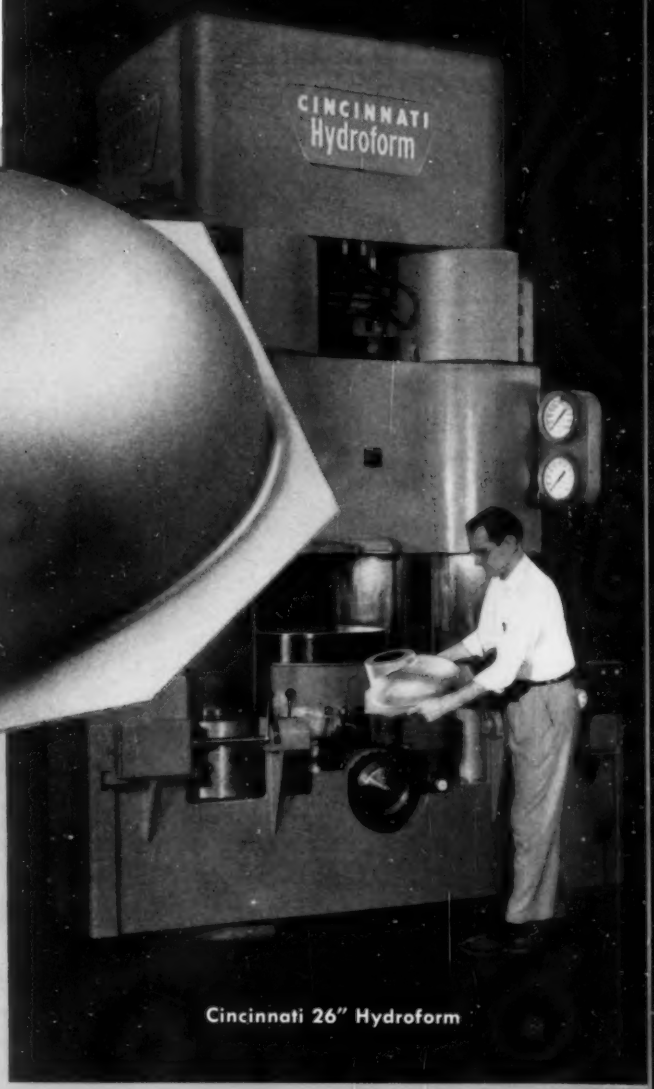
7171 E. McNICHOLS RD. • DETROIT 12, MICH.

*IN CANADA: COLONIAL TOOL CO., LTD.*

Material: .040"
Type 302 stainless steel






Cincinnati 26" Hydroform

## shows off the advantages of

# Hydroforming

***complex stainless steel shape . . . drawn in one operation . . . using low cost, two piece tooling . . . without impairing high finish of the material.***

The part, a top section of a cream separator, was drawn to desired dimensions without thin-out in *one* Hydroform operation. A 26" dia. blank having a 3½" dia. hole, was used. Tools—a male punch and a draw ring—were produced at a fraction of the cost of conventional draw tooling. As the part is a component of a food products container, finish was highly important. The part was Hydroformed without scratching or marring the polished stainless steel surfaces.

This one example is typical of the forming capabilities—the economical tooling—of Hydroforming. Can your company make use of these advantages? Call in a Cincinnati Milling field engineer. Let him assist you in evaluating Hydroforming for your manufacturing program. For a description of Hydroforming and specifications of the 8", 12", 19", 23", 26" and 32" machine sizes, write for your copy of new Bulletin M-1908.

*See other new products, Booth 100, ASTE Show.*

CINCINNATI **Hydroform**

PROCESS MACHINERY DIVISION
**THE CINCINNATI MILLING MACHINE CO.**
CINCINNATI 9, OHIO, U. S. A.

# *If* **WEAR** *is a factor...*

## *...use* VK CARBIDE PLUG GAGES

### TUNGSTEN CARBIDE
**wire type .016" to .500" diameter**

### CHROME CARBIDE
**taper insert type .500" to 1.510" diameter**

In addition to its regular line of tungsten carbide wire type plug gages from .016" to .500" diameter, The Van Keuren Company now offers a new line of chrome carbide taper insert plug gages in the range from .500" to 1.510" diameter.

*Trademark of the Carboloy Dept. of General Electric Company.

Van Keuren tungsten carbide wire type gages have proved their worth on thousands of tough gaging jobs. The new chrome carbide taper inserts (Carboloy, grade #608*) promise to be equally effective. Wearing qualities of chrome carbide are comparable with tungsten carbide. In addition, the material is lighter than tungsten carbide and has a coefficient of expansion close to that of steel . . . both of which factors are a distinct advantage in the larger sizes.

***Finish on Van Keuren gages in either tungsten carbide or chrome carbide will average .5 RMS or better.*** These gages are available in Class Y, X, and XX accuracies at moderate prices and on a reasonable delivery basis.

**Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:**

VK

37th YEAR

THE *Van Keuren* CO.,

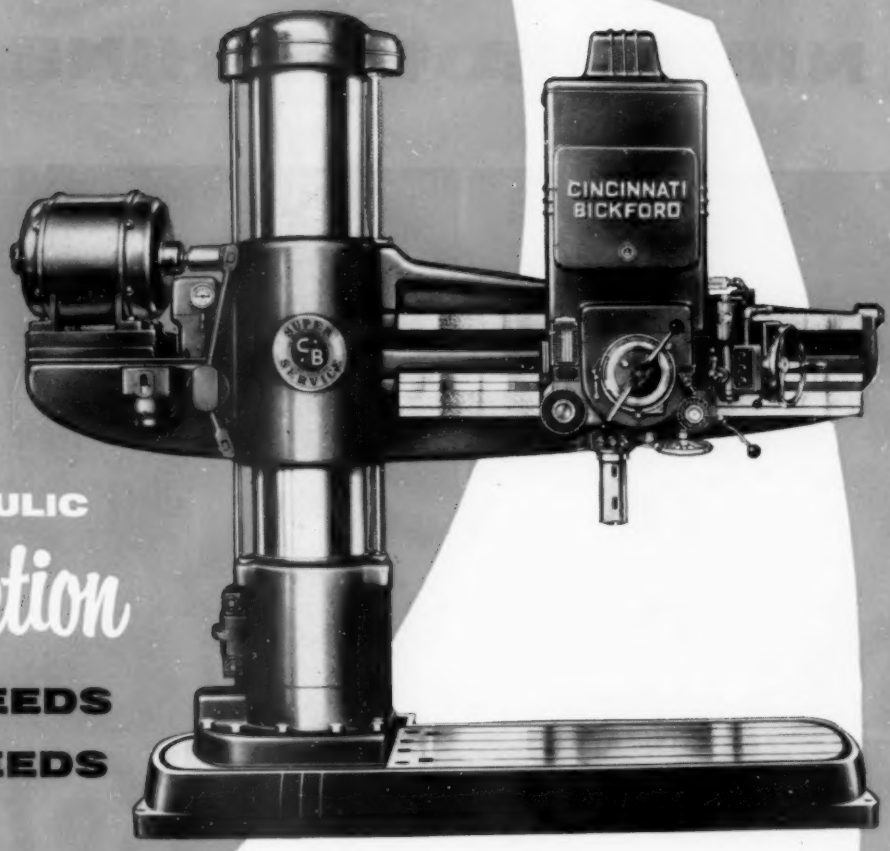
**174 WALTHAM STREET, WATERTOWN, MASS.**

Optical Flats . . . Light Wave Equipment . . . Light Wave Micrometers . . . Gage Blocks . . . Wire Type, Taperlock and Trilock Plug Gages . . . Master Setting Disks . . . Thread Measuring Wires . . . Gear Measuring Wires . . . Carbide Plug Gages . . . Laps and Surface Plates . . . Precision Lapping Service.

NEW

# 100% HYDRAULIC preselection

**of 36 SPEEDS and 18 FEEDS**




## plus ....SIMPLE PRESCHEDULING

Pre-selection of all speeds and feeds is a new development in radial drill design that saves time and effort. At any time, merely turn 2 convenient direct-reading dials to the proper speed and feed for the next operation. Gears shift hydraulically—quietly and quickly.

Pre-scheduling of radial drill operations is conveniently and simply done without expensive, complicated programming attachments on Super Service Radials. These features will cut drilling costs.

◀ Get all the facts by writing for Booklet R-33.

**CINCINNATI BICKFORD**

SUPER C B SERVICE **RADIAL AND UPRIGHT DRILLING MACHINES**

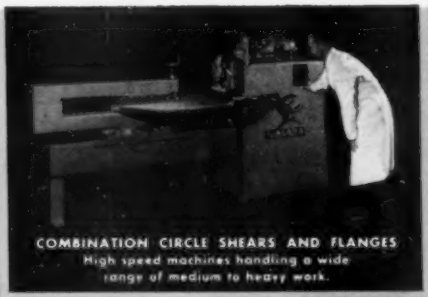
**CINCINNATI BICKFORD DIVISION**

Giddings & Lewis Machine Tool Company
Cincinnati 9, Ohio

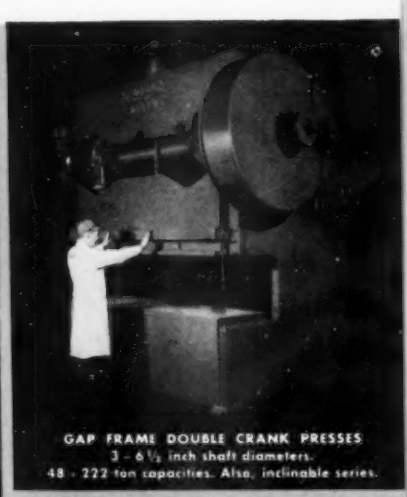
# In plate or sheet metalworking . . .

# NIAGARA MACHINES CAN

**PRESS BRAKES**
50 - 775 ton capacities.

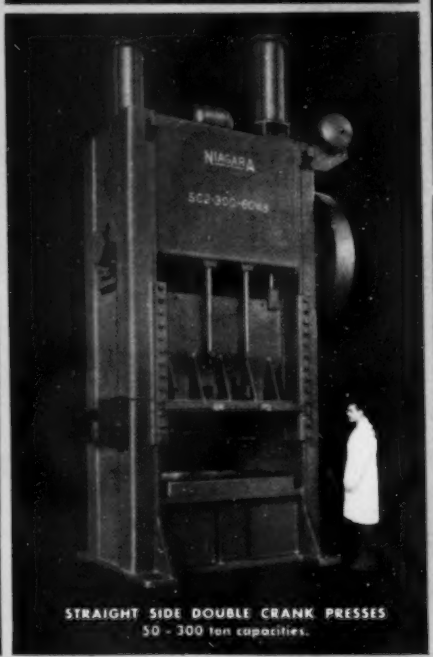


**COMBINATION CIRCLE SHEARS AND FLANGES**
High speed machines handling a wide range of medium to heavy work.



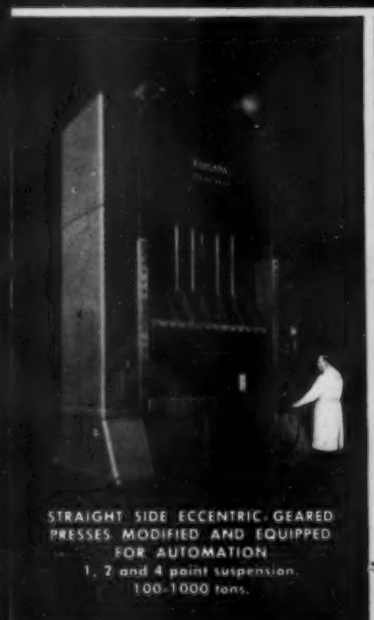
**GAP FRAME DOUBLE CRANK PRESSES**
3 - 6½ inch shaft diameters.
48 - 222 ton capacities. Also, inclinable series.

**BENDING ROLLS**
Hand and power driven for a wide range of lengths and thicknesses.




**STRAIGHT SIDE DOUBLE CRANK PRESSES**
50 - 300 ton capacities.

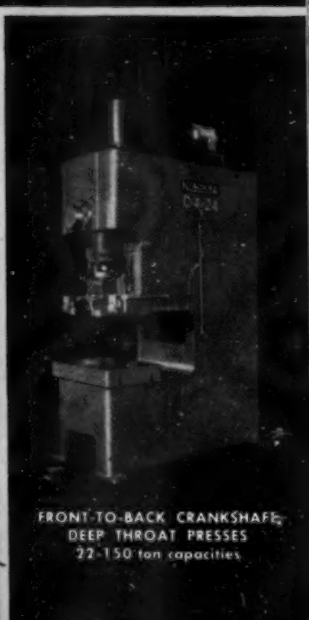
**SINGLE CRANK OPEN BACK INCLINABLE PRESSES**
1¼ - 7½ inch shaft diameters.
7 - 250 ton capacities.



**STRAIGHT SIDE ECCENTRIC-GEARED PRESSES MODIFIED AND EQUIPPED FOR AUTOMATION**
1, 2 and 4 point suspension.
100-1000 tons.

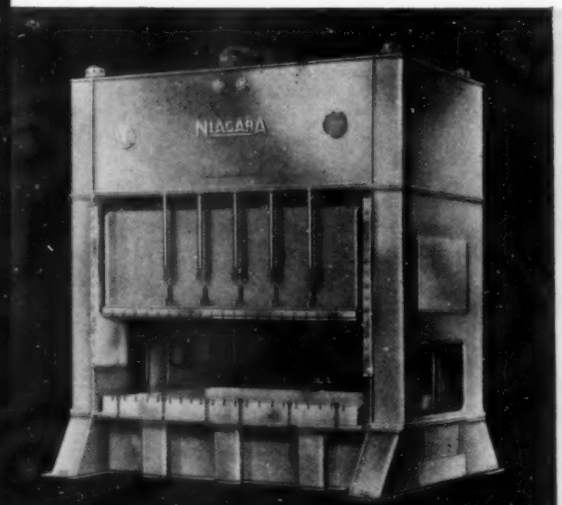
**FRONT-TO-BACK CRANKSHAFT OPEN BACK INCLINABLE PRESSES**
Standard and automation models.
75-200 tons.

**FRONT-TO-BACK CRANKSHAFT ADJUSTABLE BED PRESSES**
Standard and modified models.
22-150 tons.

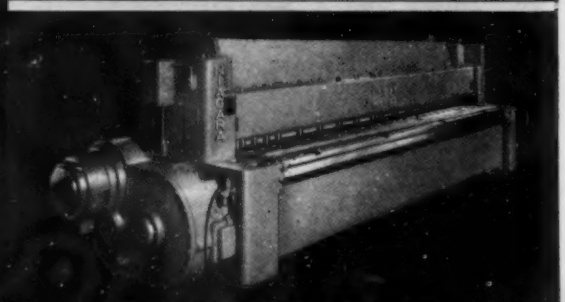


**FRONT-TO-BACK CRANKSHAFT DEEP THROAT PRESSES**
22-150 ton capacities

# DO THE MOST FOR YOU




**STRAIGHT SIDE ECCENTRIC GEARED PRESSES**
One, two and four-point suspension.
100 - 1000 ton capacities.



**UNDERDRIVE POWER SQUARING SHEARS**
Shim stock to 1 inch capacities in lengths from 3 - 20 feet

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America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

POWER PRESSES • PRESS BRAKES • POWER SQUARING SHEARS • ROTARY MACHINES • SLIP ROLL FORMERS • POWER ROTARY SHEARS • DRUM MAKING EQUIPMENT • ELECTRONIC AUTOMATIC WELDERS • GROOVERS AND SEAMERS • HAND OR FOOT OPERATED SHEARS • FOLDERS-BRAKES • LEVER SHEARS AND PUNCHES • HAND TOOLS

### ❋ MOST EXTENSIVE LINE:

**From giant, power-operated machinery to small hand tools**

### ❋ MOST ADVANCED DESIGNS:

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In the world's largest automotive and appliance plants or the smallest of sheet metal shops, Niagara machines and tools are usually at work "in force."

Batteries of giant presses are teamed up with speedy ring and circle shears. Massive, rugged press brakes stand side-by-side with powerful bending rolls and squaring shears. Versatile lever punches, rotary machines, groovers and seamers . . . all operate together to produce a better product at lower cost. The Niagara lines are "companion lines" of metalworking machines and tools that work together. A Niagara-equipped shop or plant is years ahead in quality and volume of production.

Whatever you require — power presses or hand tools — Niagara is the line that can do the most for you. It is the most complete in the industry . . . the most advanced in engineering. You can consult a Niagara representative with complete confidence of unbiased recommendations. Niagara has the right machines and tools for your requirements.

### BRING YOUR FILES UP-TO-DATE WITH INFORMATIVE NIAGARA BULLETINS

A diversified and extensive list of machines and tools make up the famous Niagara line. Some of the principal types are illustrated. Be sure that you have the latest data on the ones that apply to your work. At your request, specific Bulletins will be mailed promptly.

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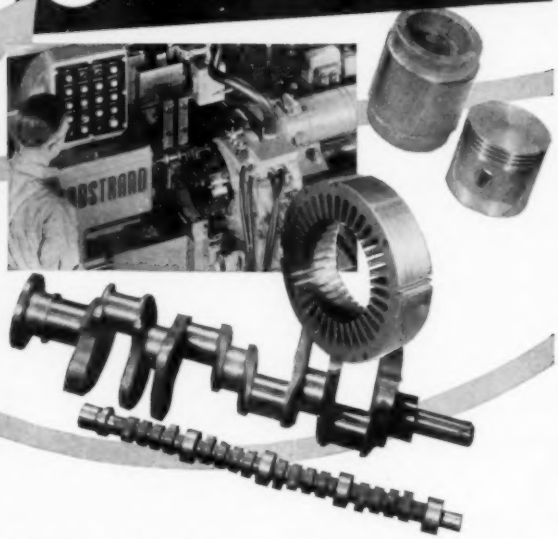
# How Sundstrand "Engineered Production" Has Been Applied To:

Production requirements dictate the proper design and tooling for all machine tools. If the required production is low and many similar parts are to be produced on the same machine, the most economical type of tooling and equipment is one that can be readily adjusted so that there will be a minimum of down time for change over. If the required production is high, the reverse is true, since the problem then is primarily one of tool maintenance coupled with automatic handling of work parts.

Sundstrand engineers have accumulated a vast knowledge of tooling from handling a wide variety of jobs. Here are just a few examples of Sundstrand "Engineered Production" as applied to turning problems.

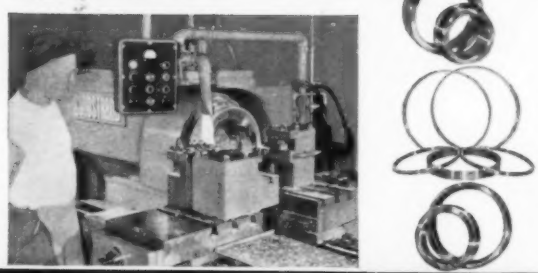
## 1 High Production Turning



The lathe above is a good illustration of a high production setup. Motor rotors are turned and faced at a production rate of over 200 pieces per hour. The machine is automatically loaded and unloaded, parts and tools are gaged for wear. Machine runs approximately an 8 hour shift, re-setting the tools automatically before a normal replacement of the tool head is necessary.

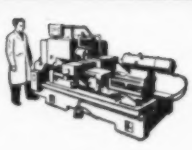
Pistons, cam shafts, crankshafts, etc. lend themselves to many of the features incorporated in this machine. If you have parts of this nature produced in large quantities, see what Sundstrand "Engineered Production" service can develop for you.

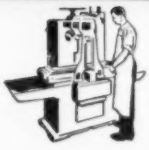
## 2 Small Lot Turning



SUNDSTRAND "Engineered Production" Service*

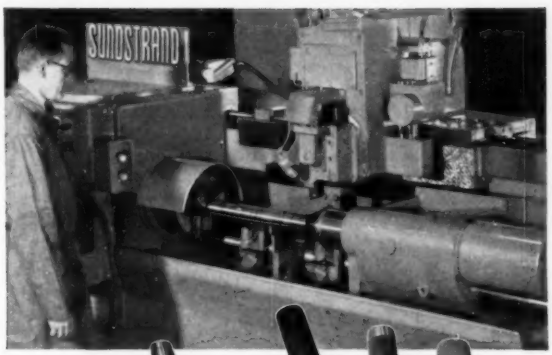
AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS





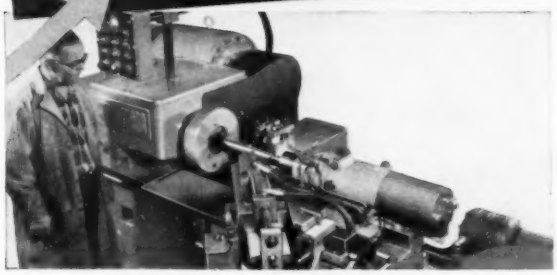
In the illustration at the left below, more simple tooling, easily adjusted, has been provided to handle a number of different sizes of similar parts. Tool adjustments are easy because of the simplicity of the tooling, and the quick set cycle control of the Sundstrand Automatic Lathe makes it profitable to use multiple tooling on jobs of this nature.

## 4 Shaft Turning



This machine is offered with punch card control or manual operation. With punch card control, it brings production control to the engineering department. Again, it is a design solution to turning of shafts, but talk to Sundstrand Engineers and investigate Sundstrand "Engineered Production" for the proper solution to your job.

## 3 Tracer Turning

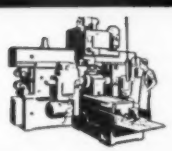


Multi-cycle single point turning of irregular shapes can be obtained quickly and easily with new Sundstrand Automatic Lathes equipped with this tracer control. The lathes are provided with a template controlled tracing unit, which replaces the regular front carriage. Ruff, semi-finish and finish cuts can be made with one turning tool in one automatic cycle.

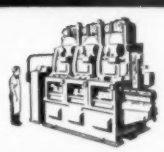
## Before You Buy Any Turning Equipment Check with Sundstrand *"Engineered Production"*

These are only a few of many applications of Sundstrand "Engineered Production" as applied to turning problems. Your job may be entirely different, but we invite you to investigate. Call in a Sundstrand engineer. There is no obligation for this service.

TRIPLEX RIGIDMILS



SPECIAL MACHINES



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**Machine Tool Co.**
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## New KNIGHT'S Jigmaster

Last word in medium size jig borers—unequalled for extreme accuracy, capacity, increased output.

The totally enclosed spindle and quill mounted on super-precision ball bearings, with quill moving in a solid bearing . . . the extra-wide base and reinforced column, both cast as a single unit . . . the wider bearing surfaces . . . all contribute to the Jigmaster's exceptional rigidity and accuracy.

Any one of three table and saddle locating devices may be used for hole location. All machine controls can be operated from a single convenient location

*Write For Complete Information*

### SPECIFICATIONS

| | |
|---|---|
| Table Size | 18" x 24" |
| Table Travel—Longitudinal | 20" |
| —Cross | 15" |
| Vertical Capacity | 23" |
| Throat | 20" |
| Weight | 7500 Lbs. |

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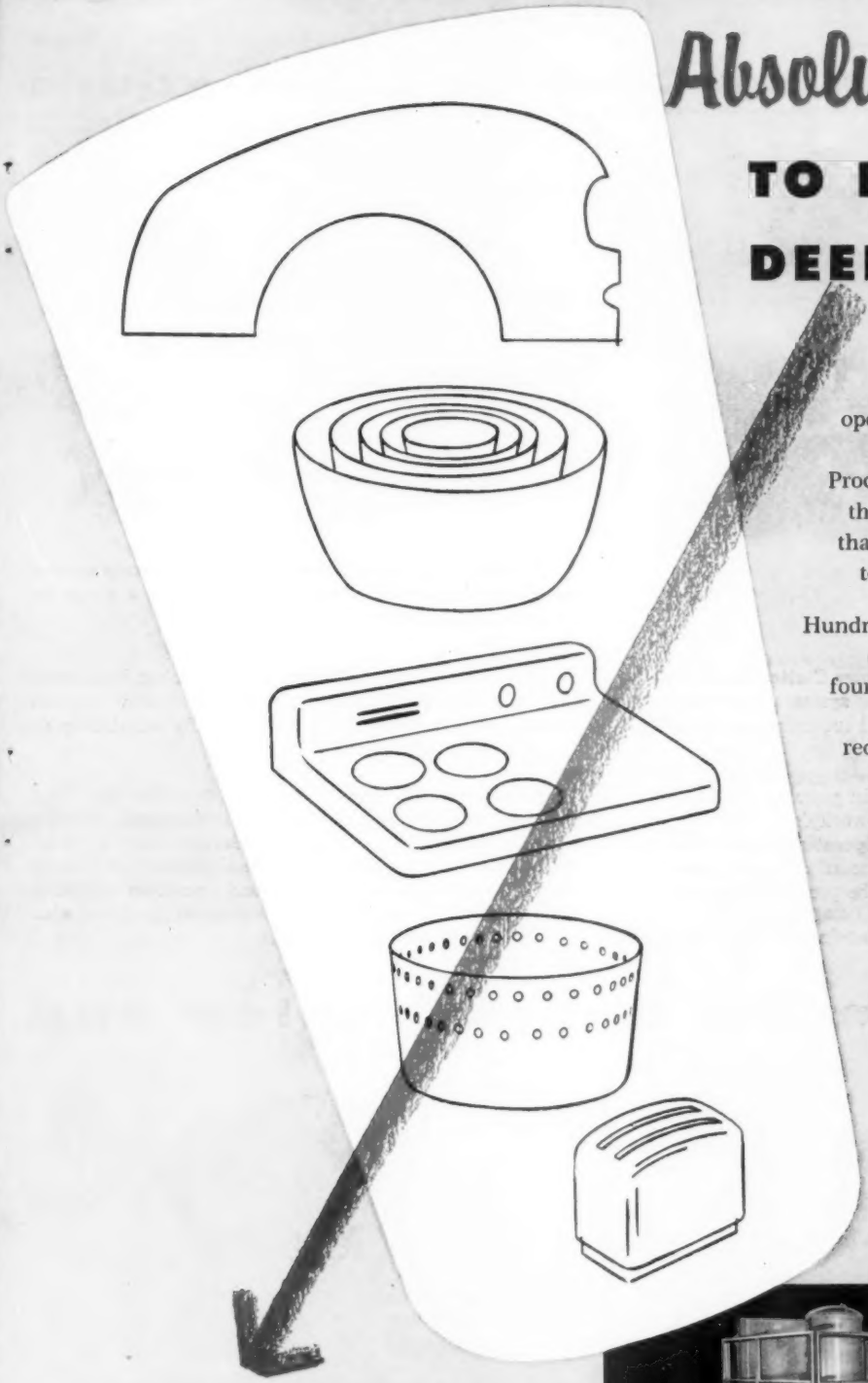
# Absolutely Vital

## TO BETTER DEEP DRAWING



If deep drawing is one of the operations in your plant, you should know about the McKay Flex-Roll Processor, a rugged, efficient machine that quickly works steel to a degree that it can be deep drawn without tearing or showing draw strain.

Hundreds of manufacturers, including every major auto producer, have found the Flex-Roll pays for itself in a few months by substantially reducing scrap and metal finishing after the draw.

Let us put you in contact with a Flex-Roll user — he'll quickly convince you that it's absolutely vital to modern day deep drawing.

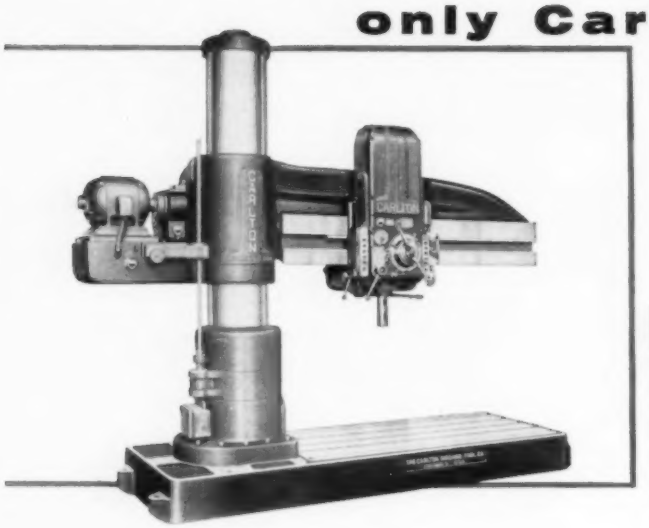
The McKAY MACHINE Company
YOUNGSTOWN, OHIO

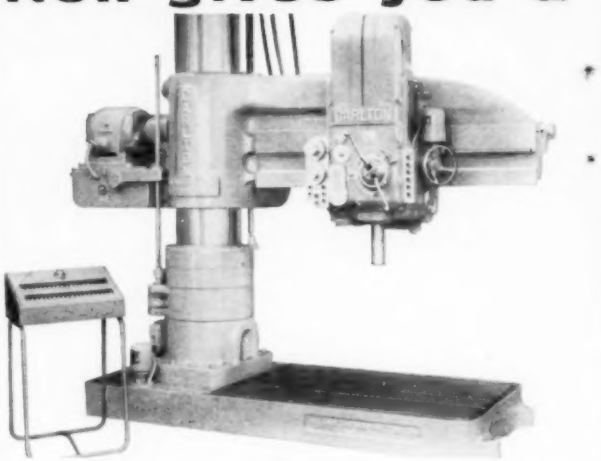
McK

# McKAY

## Flex-Roll PROCESSOR

# only Carlton gives you a





**1. Programming and pre-selector gear shift** sets up correct speeds and feeds for a complete sequence of operations.

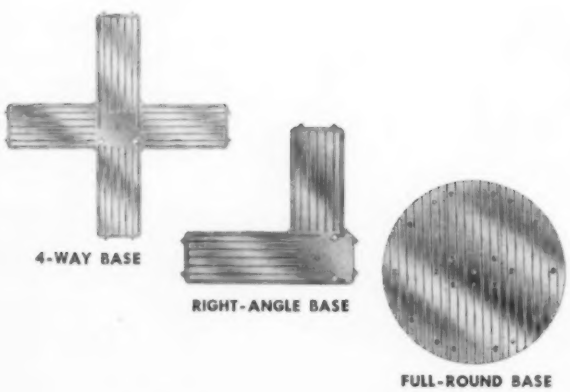
With the introduction of the new Carlton-Leber speed-feed programming and pre-selector systems, you can now take your choice of three speed-feed controls: programming, pre-selector or manual.

**Programming** works like this: your production engineering department studies the workpiece drawing and determines the sequence of drilling operations and the correct speed and feed for each. This data is recorded on a routing sheet or blueprint and is transferred to the programming console.

The programming console contains an indexing dial which shows the operation sequence number being performed. Operator has local control and can perform operations out of sequence by manually advancing or reversing the indexing dial.

**Pre-selector:** For less lengthy or complicated drilling jobs, the programming unit can be disconnected through a selector switch and the pre-selector then becomes operative. The pre-selector saves time by allowing operator to select speed and feed for the next operation while the machine is under cut. Pre-selector may be furnished with or without the programming unit.

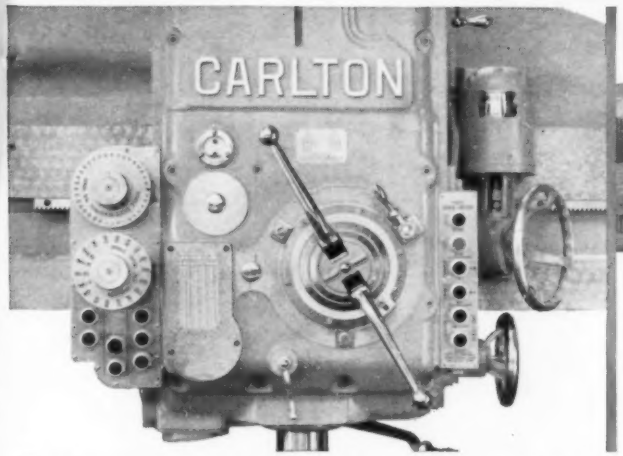
# and special bases, tables and



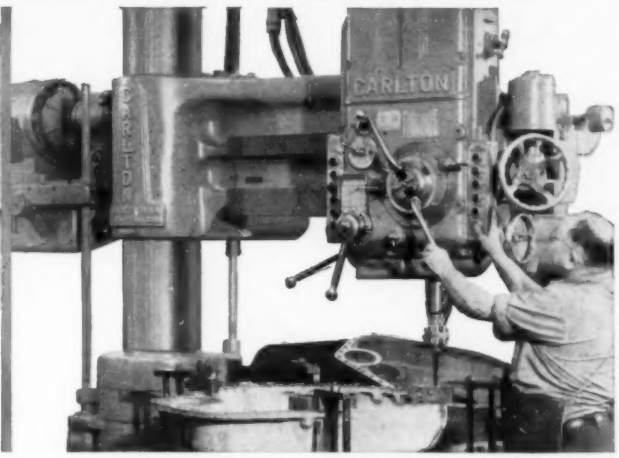
**Special bases:** Carlton radial drills can be furnished with any of seven different types of stationary bases (three of which are shown above). In addition, special track type mounting and sliding bed plate base also available.

**Special tables:** Plain, uni-tilt and full universal tables available as extra equipment. The universal table shown above is Carlton engineered and built, is fully universal and has a 32″ round top.

# choice of 3 speed-feed controls




**2. Pre-select gear shift:** 1 speed graduated dial and 1 feed graduated dial pre-set speeds and feeds.




**3. Manual gear shift:** 2 shifter levers for controlling speeds, 2 shifter levers for controlling feeds.

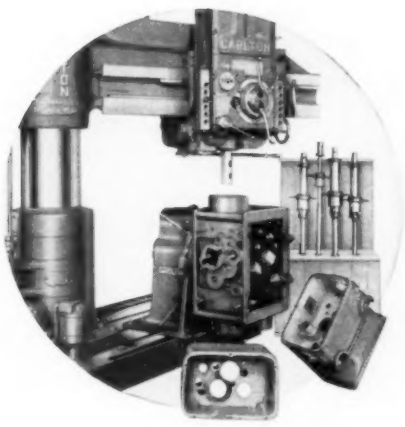
**Manual gear shift:** Selects speed-feed combinations in the conventional manner—manually, one at a time, using two speed shifter levers and two feed shifter levers.

Carlton gives you a wide choice in radial drill selection . . . not only in speed-feed control systems, but also in size and capacity. You're sure to find your most economical drill size at Carlton, because the broad Carlton line includes arm lengths from 3-ft. to 12-ft., column diameters from 9″ to 26″. For the complete range of sizes, send for descriptive literature.

Carlton also gives you the advantage of a wide selection of special bases, tables and jigs and fixtures (see below). A capable sales-engineering staff will study your requirements and submit without obligation a recommended tooling set-up that's best for you.

Carlton has just published a new 24-page booklet presenting the most modern concept on how you can get better, more efficient, lower cost drilling. Why not write for your free copy today? The Carlton Machine Tool Co., Cincinnati 25, Ohio.

# jigs for additional productivity



**Special jigs:** Carlton engineers will be glad to recommend the most efficient tooling for your requirements. The set-up shown above reduced running and set-up time from 7 hours down to 5.25 hours. Includes master trunnion, jigs and boring bars.

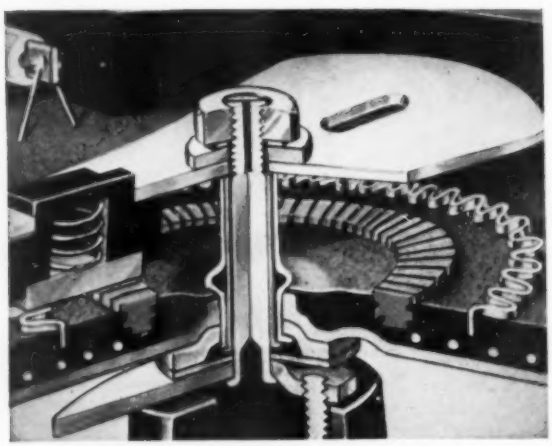
Carlton

*horizontal and radial drills*

# Extruded Shape Cuts Assembly Over Half

A Ward Leonard Type M Vitrohm rheostat using contacts made from extruded shapes

## Ingenious application eliminates hand assembly, makes absolutely uniform stationary contacts in Ward Leonard power rheostats



**CROSS SECTION VIEW** of a Ward Leonard Vitrohm Type S rheostat showing how contacts are embedded in a vitreous enamel.

Ward Leonard Electric Co., Mount Vernon, N. Y., makes a line of high quality power rheostats marketed under the trade-name Vitrohm. Anywhere from 41 to 161 individual stationary contacts, or buttons, have to be embedded with their resistance elements in an insulating vitreous enamel—all contacts uniformly set and spaced, for uniform performance. Their patented process originally used buttons blanked out of sheet brass—hand assembled and spaced on a steel wire to hold them while the vitreous enamel was fired.

Ward Leonard refined the process and for four models now starts with the extruded shapes shown above. The stock is accurately slotted for correct spacing, forming a continuous line of buttons connected by a triangular "wire"—which is an integral part of the extruded shape. When sections are curved, the buttons remain uniformly spaced and oriented. After the button assemblies are embedded in the vitreous enamel, the connecting wire is easily milled off. Ward Leonard gets absolute uniformity with less effort and fewer rejects—it gets healthy dollar savings, despite the fact that more than half of the extruded shape is milled out.

Imagination applied to extruded shapes can pay big dividends—lower direct labor costs—fewer machining operations—less scrap—improved product quality. Your Anaconda representative will be glad to work with you. The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 5584

**ANACONDA®**

**EXTRUDED SHAPES**

**Short cuts to a finished product**

...corner high production

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Threadwell

DISTRIBUTOR

FOR THE FINEST IN
CUTTING TOOLS AND GAGES

Made by THREADWELL, Greenfield, Mass.

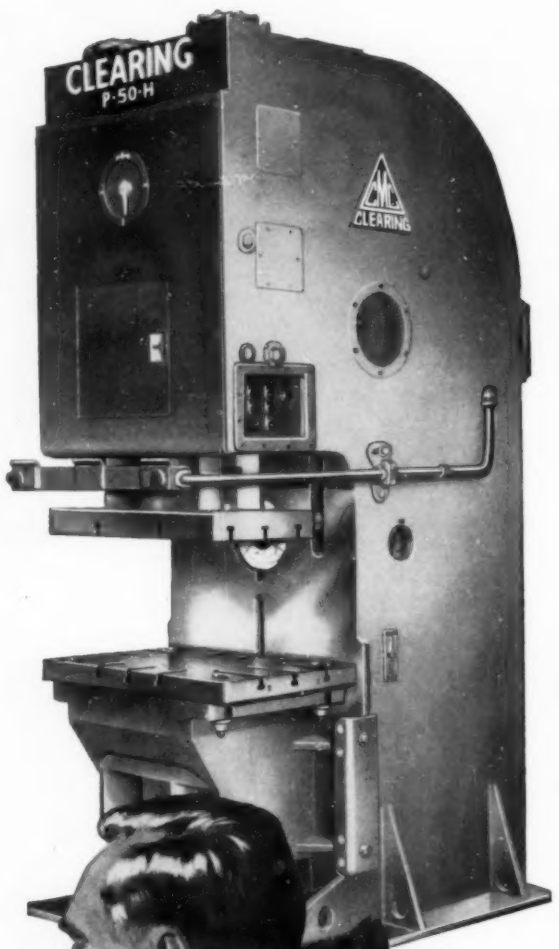
# Simplify PRESS LINE LAYOUT,

## BOOST PROFITS WITH THE CLEARING P-50

The Clearing P-50—a brand new idea in metalworking presses—may be able to solve some problems in your shop. First of all, the P-50 is designed for complete versatility. It can do practically any job in its capacity range. Its adjustable table will provide the right die space for both high and low dies. Remove the table completely for horn press operations.

Put it anywhere in your press line to perform follow-up operations or tool it up for a long run blanking or forming job. The P-50 is built to give top production in either spot.

The P-50 is designed for simple portability and installation. Its enclosed design means that if it will fit into a spot it can be operated there. Gearing and flywheel are built into the frame; so are controls and die space lighting. Simply connect your air line and power; the P-50 is ready to go. If your production setup can use a utility press the P-50 will pay for itself in convenience and time saved. Find out more about it. Write or call Clearing for more information.




*This completely self-contained P-50 features fully enclosed design and built-in controls. This speedy machine (single strokes at 80% of rated strokes per minute) can be moved anywhere in the shop and put into operation in a matter of minutes.*

Write for Clearing brochure, "Thinking about a better way to do the job?"

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# The Tool Engineer

## How Good Are Your Prices?

1955 has now been recorded as the greatest year in the history of these United States of America. New records were set everywhere. Steel production hit 117 million tons—the automotive industry assembled 8 million passenger cars—electrical power reached 540 billion kilowatt-hours—employment rose to almost 66 million and wages soared to a new high.

Without even stopping to catch its breath, American industry is moving forward with new plants and new facilities, not only for 1956 but for succeeding years. This means more and keener competition. Companies must operate at higher profit levels than have been satisfactory in the past, getting better value from the investments in machinery and equipment.

The necessity of knowing production costs is obvious but just having good cost accounting is not enough. The economic facts of life, particularly as applied to each different manufacturing operation, must be understood by everyone from the boss on down to the lowest level of supervision—and this picture is constantly changing. To price your product you must know your current costs. Too few companies do.

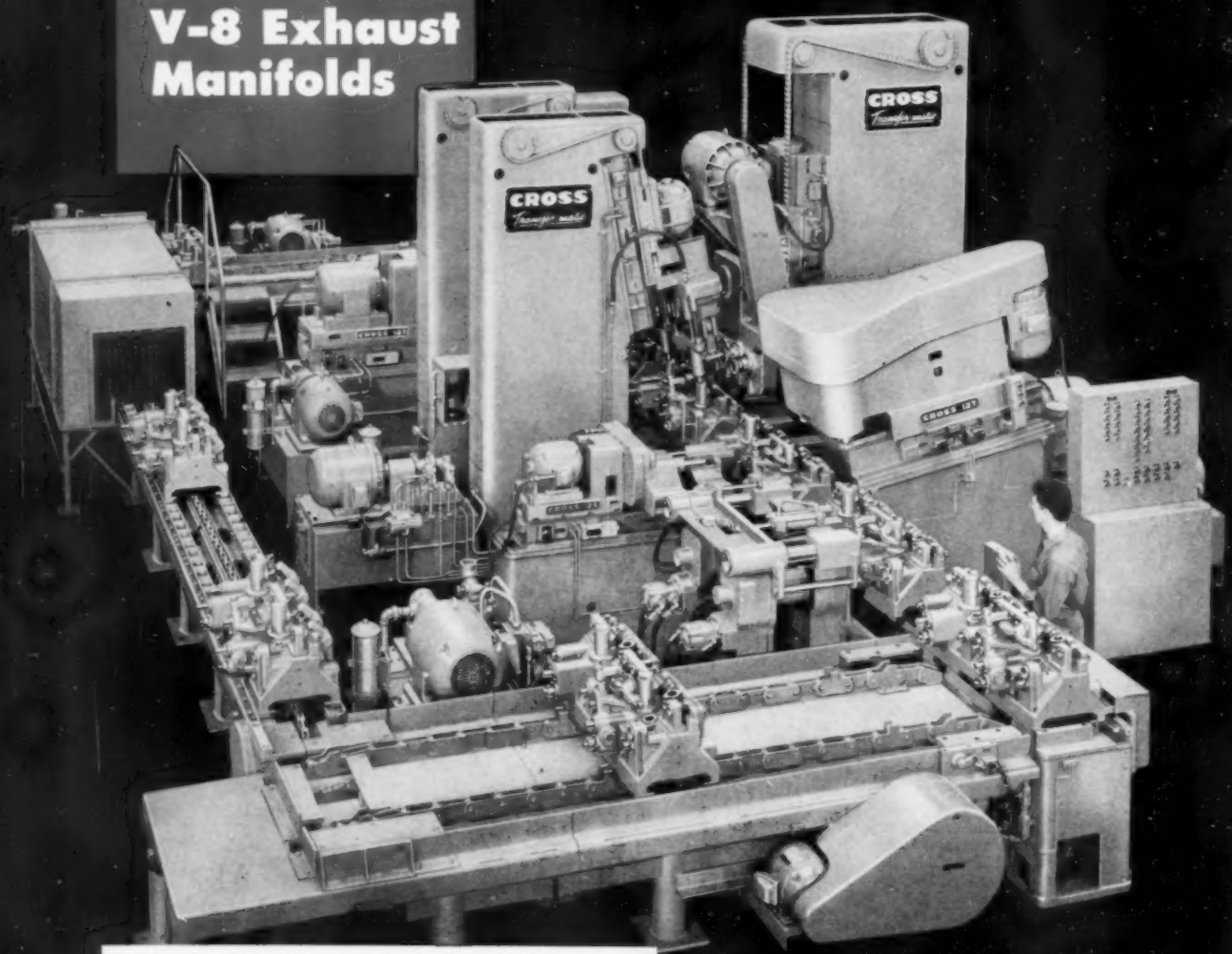
Your prices are only as good as your cost information.

H. B. Osborn Jr.

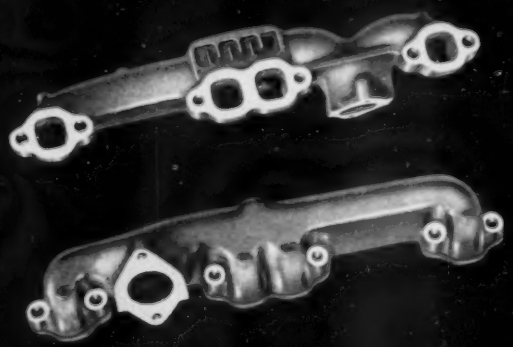
PRESIDENT

# Completely Machines V-8 Exhaust Manifolds

*Another Transfer-matic by Cross*




- ★ 51 operations: 8 milling; 37 drilling, chamfering and spotfacing; and 6 tapping.
- ★ Palletized work holding fixtures for holding one right hand and one left hand part.
- ★ Automatic power wrench for operating work holding fixtures.
- ★ Automatic transfer mechanism.
- ★ All parts in Cross machines—even tooling details—are made to interchangeable tolerances for fast, easy maintenance.
- ★ Other features: Construction to JIC standards; hardened and ground ways; hydraulic feed and rapid traverse for milling, drilling and boring; individual lead screw feed for tapping.



*Established 1898*

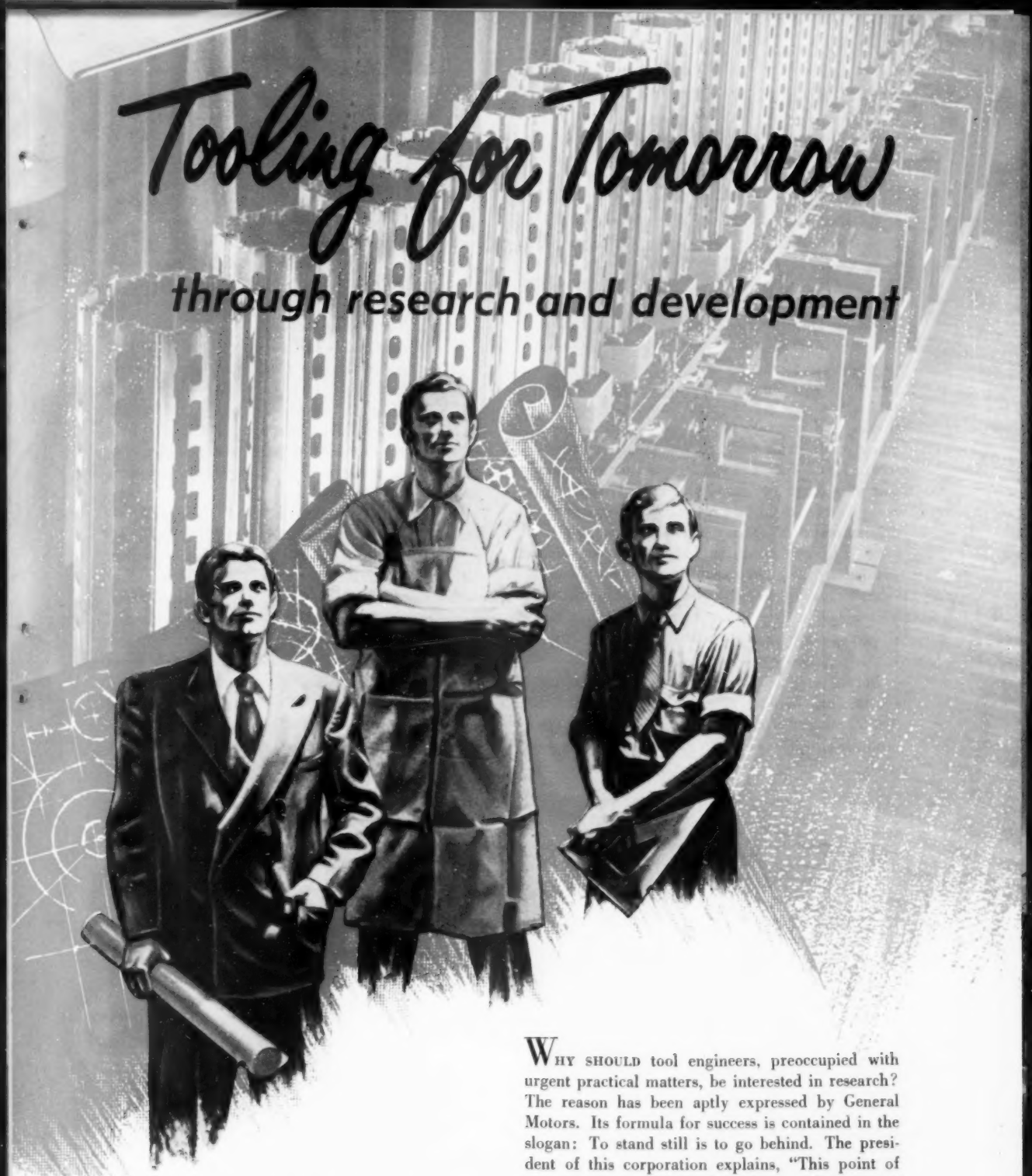
THE CROSS CO.

*First in Automation*

DETROIT 7, MICHIGAN

# Tooling for Tomorrow

## through research and development



**By Ralph H. Eshelman**
**Associate Editor**

WHY SHOULD tool engineers, preoccupied with urgent practical matters, be interested in research? The reason has been aptly expressed by General Motors. Its formula for success is contained in the slogan: To stand still is to go behind. The president of this corporation explains, "This point of view is never satisfied with things as they are. It assumes that everything and anything—whether it be product, process, method, procedure or social or human relations—can be improved."

As might be surmised, companies exhibiting the greatest interest in research and development programs are, with few exceptions, leaders in their

fields. Obviously, firms such as du Pont, General Electric, Minneapolis-Honeywell, General Dynamics, Westinghouse, International Business Machines, Aluminum Co. and General Motors have both the means to support programs and the diversification to exploit them.

On the other hand, small and medium-sized concerns are often able to squeeze greater mileage from each dollar spent because of close coordination and excellent communication between scientists, engineers and operating personnel. Outstanding results have been achieved by many smaller organizations such as Harvey Aluminum in the field of impact and tapered extrusions for aircraft, Chambersburg Engineering in forging, Airborne Instruments and others in the application of electronics and controls to automation. In addition, many small firms have pooled their resources to secure benefits of centralized research, or become a part of a larger company's diversification program as typified by that of American Machine and Foundry. In the latter instance phases of atomic research have been applied to manufacturing operations, particularly as beta-ray gages in precision-feed devices in control of automatic cigarette machinery.

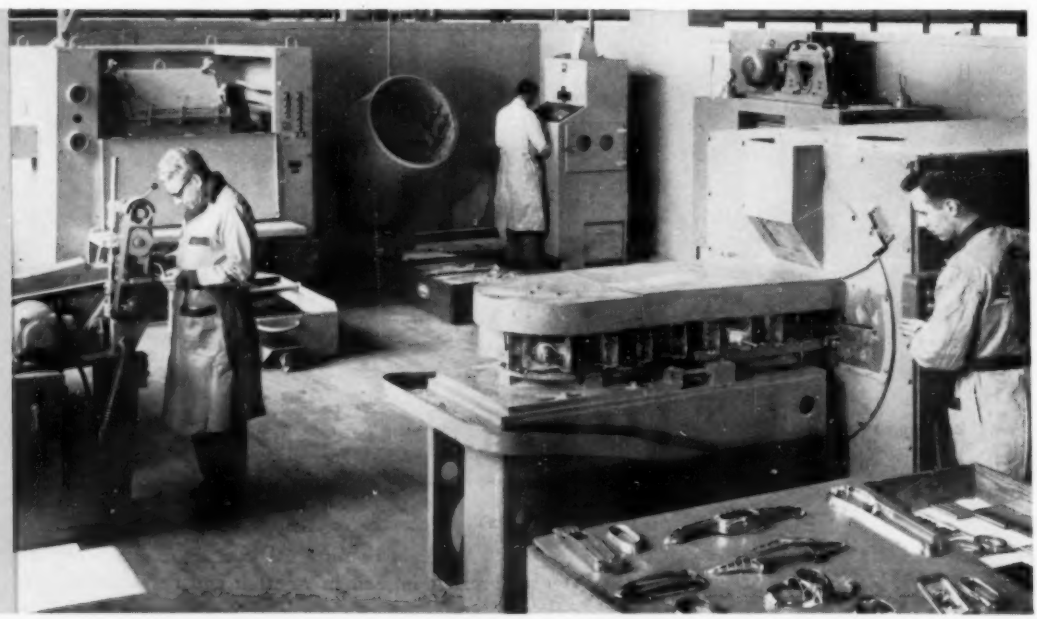
## Result of Research

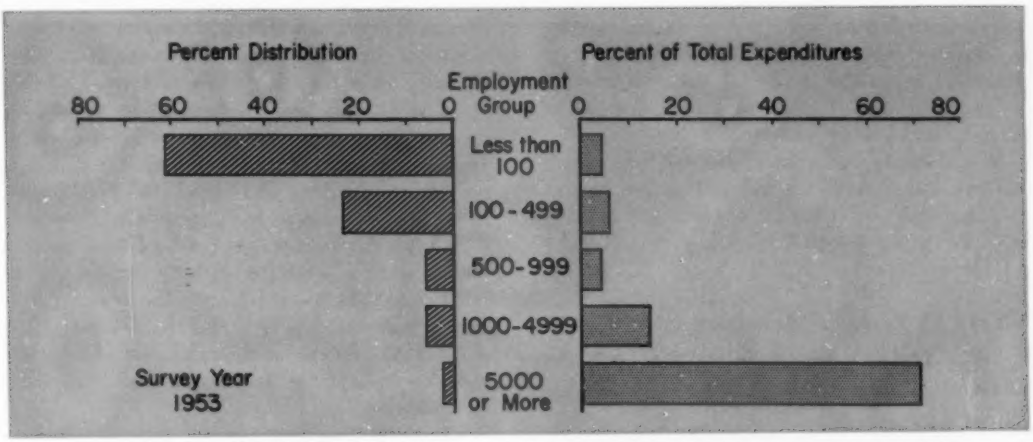
In the product field, research has been most spectacular. Reports of many companies indicate that 50 percent or more of current sales result from products which were not in existence 15 years ago. This tremendous success accounts for the increasingly vast funds being funneled into research by industry, Results of research are less apparent in the field of manufacturing. Many of the remarkable changes occurring in tooling in the past few years can be attributed more to evolutionary development than to research. Under this head can be included automation, improvements in casting, such as continuous casting and large-size die castings of aluminum. The heavy press forging program might also come under this head, as well as many of the new cold forming methods.

Nevertheless, research has played an important role in many advances: electromachining, electrolytic grinding, use of ultrasonics in testing, cleaning and machining, the development of ceramic cutting tools and the creation of plastics usable for tooling. Often, with improvements in metalworking as elsewhere, both research and development play vital parts, and each has its place.

Research in the industrial field is generally assumed to mean applied research since, for budgetary reasons, justification must be given each project. Although concerned with specific answers rather than freely pursuing great unanswered questions of the universe, applied research can usually be thought of as separated from the immediacy of day-to-day business. Often, laboratories are located away from the plant for psychological reasons. In contrast, development work usually seeks practical improvements or conversion of the results of research into products, machines or processes. Dividing lines

**Experimental work in metal finishing is carried on in process development laboratories at General Motors Technical Center.**



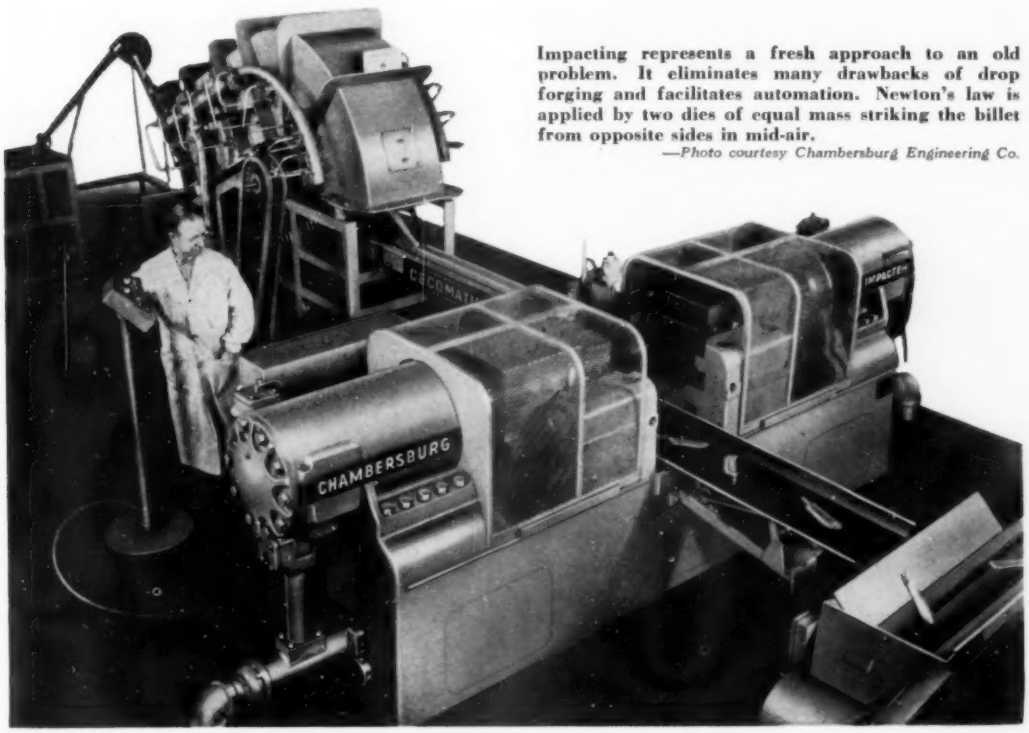



**Distribution of companies conducting research and development programs (left) compared with percent of total expenditures (right).**

*—Bureau of Labor Statistics*

between the three are difficult to draw. As the noted nuclear chemist and Nobel prize winner, Glenn T. Seaborg is fond of wryly pointing out, even the purest scientist is anxious to point to outstanding applications and swear they could not have happened without basic research . . . especially to trustees and legislators concerned with appropriations.

The automatic aluminizing process for automotive valves (The Tool Engineer, Feb. 1956) exemplifies the potentialities of industrial research. After the corporation laboratory appraised aluminizing for this application and found indications favorable, a laboratory process was developed. When applied to production, the experimental process proved unsuited to the particular application. From further engineering development emerged a mechanical method which was then embodied in an automatic installation. As in this typical case study, the tool engineer is vitally concerned with research as soon as the results are to be applied to production. He




**Impacting represents a fresh approach to an old problem. It eliminates many drawbacks of drop forging and facilitates automation. Newton's law is applied by two dies of equal mass striking the billet from opposite sides in mid-air.**

*—Photo courtesy Chambersburg Engineering Co.*

may have to find a new method of manufacture for a newly created product, such as germanium transistors, or he may be involved in the application of a new material for tooling, such as in the case of ceramics and plastics.

In any event, the results of research can seldom be harvested without the aid and cooperation of tool engineers. That is why research and development are at the heart of any study of tooling for tomorrow.

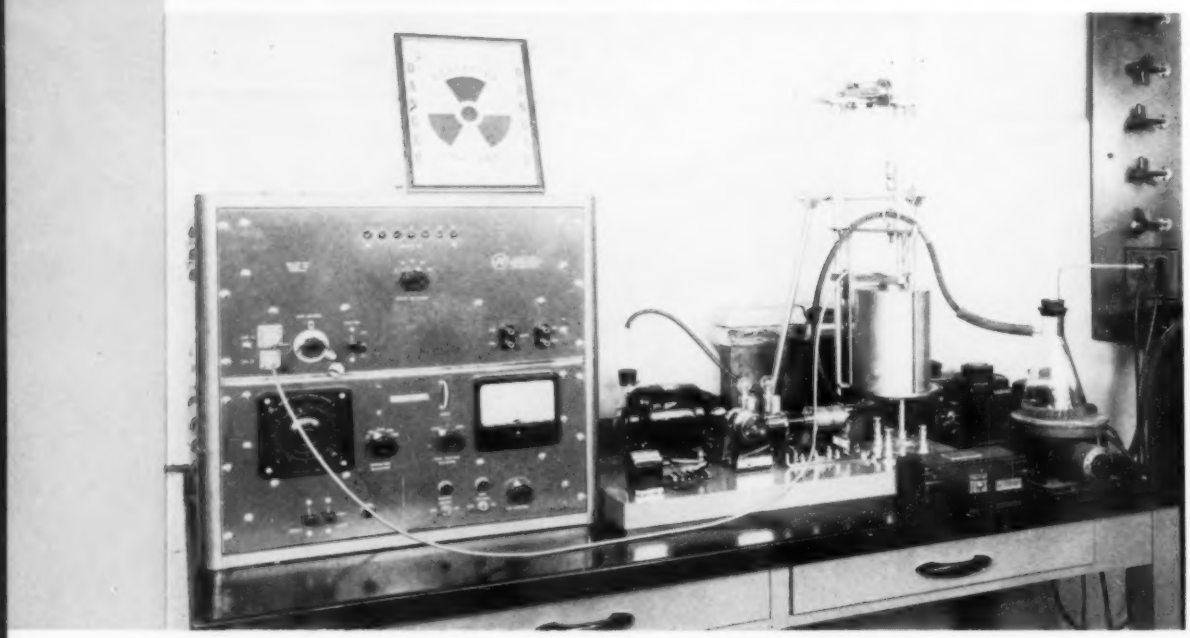
### Survey of Research Activities

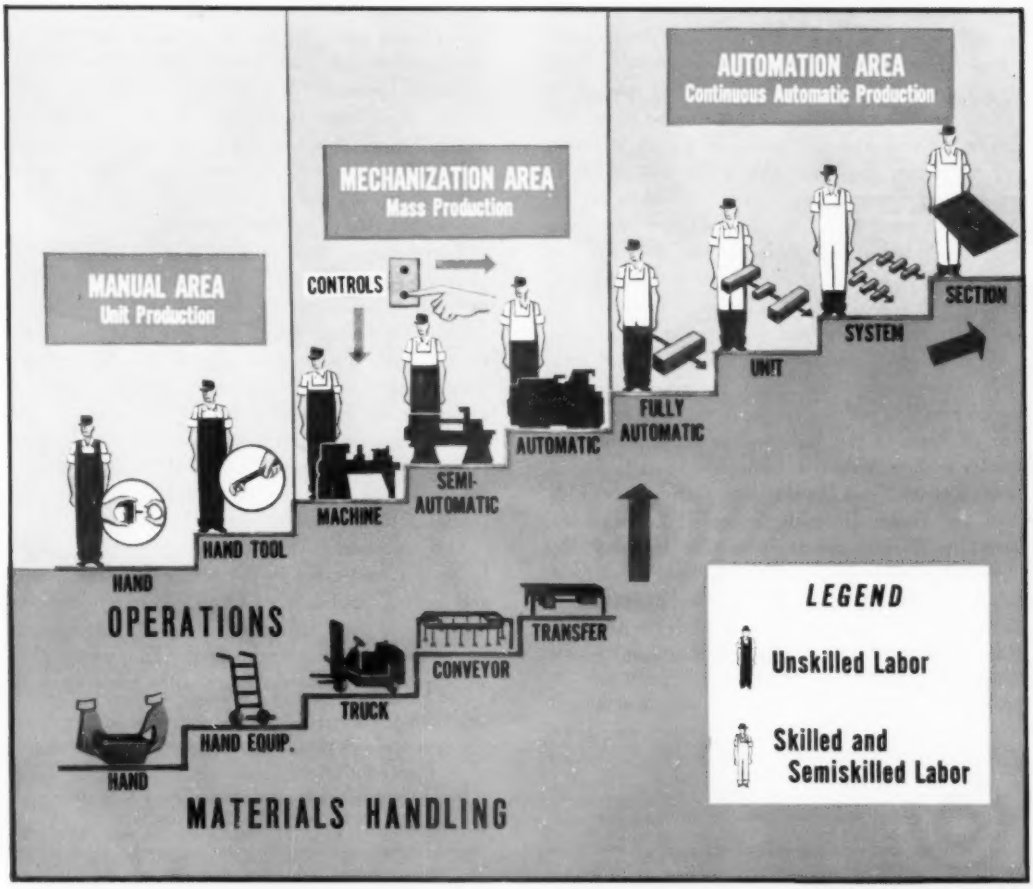
The National Science Foundation, with the assistance of the Bureau of Labor Statistics, has attempted to evaluate industrial research by a recent survey. According to Alan T. Waterman, foundation directer, more than $5 billion is annually being spent in research and development by private industry, education institutions, government agencies and other organizations. Private industry performs roughly two-thirds of all research and development in the natural sciences and engineering. Over one-third of this amount is done for the federal government, chiefly on contracts with the Department of Defense and the Atomic Energy Commission. The survey indicates, however, that only 4 percent—about $150 million—of the total cost of research and development for the sample year 1953 went into basic research.

Another surprising fact is that more than 15,000 companies are involved in research and development work. Of these, about 13,000 or 85 percent are firms of less than 500 personnel. These smaller companies, however, perform only about one-tenth of the total work, whereas the 375 largest concerns with 5000 or more employees accounted for about 70 percent. This survey confirms the generally accepted belief that American industry has entrusted

**(Left) Automatic ultrasonic cleaning is used to insure optimum performance of relays by removing contaminating dirt, grease, solder flux and other accumulations from fabrication and assembly at Potter & Brumfield Mfg. Co., subsidiary of American Machine & Foundry.**

**(Below) Radioactive isotopes, a nuclear fission by-product, are employed in research and development at Chrysler Corp.**






—*Courtesy General Electric Co.*

**Improvement chart depicts progressive steps to automation. As production becomes more automatic, productivity increases. Manual operations are common in assembly, inspection and materials handling. In mechanized manufacture, processing and handling are not completely integrated as in automation. Operations can best be upgraded in single steps.**

its future to scientists and engineers in the laboratory.

What is the nature of the research and development team of today and why has it been so astonishingly successful? A wide variety of specialists are represented. These may include physicists, chemists, methematicians, metallurgists, electronic engineers, mechanical, hydraulics and acoustical engineers and others depending on the scope and nature of the company's activities. The theory behind the wide range of abilities represented is that a fresh approach and new ideas can be brought to bear on the complex problems of modern industry. Moreover, this cross-pollination stimulates creative thinking. The increasing complexity of industrial technology and the wide spectrum of knowledge that must be tapped explains the disappearance of the individual inventor operating with ingenuity and intuition. The inquiring mind and inventiveness, however, are still in great demand.

Research men are vitally aware of the complementary nature of the partnership between technology and science . . . the engineer and the scientist. Each has a contribution to make, which may be most unpredictable. For instance, the idea for the use of wood in making paper came from an 18th century naturalist rather than from a chemist. The germ of the idea came from his observation of wasps building their nests.

Clearly, a fresh approach is paramount and new ideas must constantly be thrown into the hopper. By nature and training, the scientist of the team is one who asks Why; the engineer, on the other hand, is concerned with How. As E. W. Engstrom of RCA states it, "An effective research team must include creative people with all the needed skills. Cooperation must exist between the members of the team and the development and production engineers who must carry the research results into commercial production."

To sustain the high level of creativity necessary for such work and yet achieve practical results poses a real dilemma. According to a considerable body of evidence, a person's most creative period is during the 20's and 30's. This is why so many outstanding discoveries are made by young scientists and engineers. Moreover, this is the reason that an experienced research team must be continually infused with new blood by the addition of young members. Like a championship ball club, the best team seems to be one combining the enthusiasm and initiative of youth with the judgment, maturity and administrative ability that comes with experience.

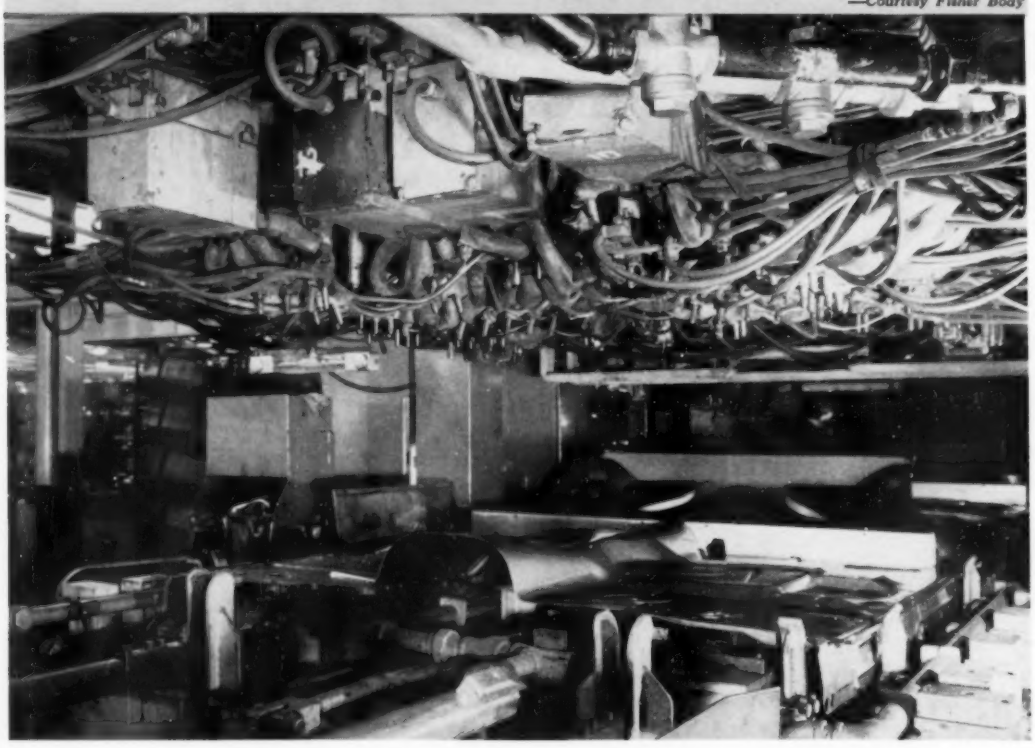
In addition to industrial laboratories and technical centers, large and small, the total picture of research in this country includes many other facets. One of these is the independent commercial laboratory such as Arthur D. Little, Frederick S. Bacon, Evans Research and Development Corp., Miner Laboratories, Foster D. Snell, Truesdail Laboratories, Comstock Wescott and many smaller organizations. The total contribution of these has been substantial. Further, there are many outstanding nonprofit institutes such as Armour, Battelle, Cornell Aeronautical, Franklin, Mellon, Midwest, Southern, Southwest and Stanford.

Often, laboratories are associated with endowed foundations such as the Rockefeller Institute of Medical Research, Carnegie Institute of Washington. However, the center of basic research remains in the higher educational institution. In addition to nurturing future scientists and engineers, colleges and universities with their unfettered approach to questions of science and nature provide the spark that kindles the fire of applied research.

There can be little doubt that Einstein's theories of relativity and energy laid the basis for the atomic age. Many advanced thinkers are now speculating whether his unified field theory may lead to answers on the basic questions of life, matter and energy. Investigation of his suggestion that gravitational and magnetic forces may be manifestations of the same phenomena may have profound implications for industry and manufacturing. Even a minor discovery in the field of basic research can detonate reactions throughout industry.

The significance for tool engineering is clear. Industrial leadership in the future calls for a bold and daring approach. Instead of merely making chips faster than before, creative cost cutting calls for a more imaginative attack. The paradox in metal cutting is that the more chips there are pro-

**Advances in automatic assembly are represented by this machine combining functions of assembly fixture, multiple welding mechanism and work handling. Part is floor pan (center).**
*—Courtesy Fisher Body*



duced, the more is lost. To cite an instance, an automotive manufacturer was removing 13 lb of metal in finishing a crankshaft. By employing shell molding, this was reduced to 5 and later to 3 lb until the part could be finished without turning but by grinding alone. Finally, metal removal has been reduced to one lb and the crankshaft is virtually completed by rolling, alone. Today, crankpins, threads and splines are rolled to size with a greatly improved finish and structure and at an annual savings in millions of dollars.

The "tools of destiny" that will shape the future are already at hand, Robert Douglas, chairman of the ASTE Research Committee declares. Cybernetics —communications and controls theory applied to automation—is forcing a profound revision in manufacturing thinking with such developments as automatic quality control, programming and numerical machine control. Soon the blueprint may be as obsolete as a tool for shop communication as the hand drill is as a production tool. Again, nuclear technology may completely alter the future of manufacturing. Electronics, as embodied in computers and computer control components is already cutting across conventional lines in solution of engineering problems. Solar technology, apparently a singularly unprofitable field for industrial research, may uncover something as radical and far-reaching as Watts' steam engine proved in the 19th century.

For tool engineers, reorienting to the new era should be readily accomplished. The profession has long associated inventive ability with solving problems in daily work. This is especially true in smaller plants where facilities are limited. In the past, tool engineers' creativity has been largely responsible for the great advances of this century in productivity.

## Facing the Future

A practical question that must be faced by many tool engineers in looking to tooling for tomorrow is what should the medium and smaller-sized organizations do? Compared to the large sums expended by some corporations, any efforts of smaller companies might appear to be futile. Fortunately, in this area it is quality rather than quantity that counts. A manufacturing firm, regardless of size, can have a definite program of continuing improvement with search for and development of ideas tailored to its own peculiar situation.

A vast fund of information is already available on topics ranging in scope from automation to atoms. For example, General Electric has prepared a new approach to automation which brings it down to a grass roots level. By breaking it into separate steps, shown in the accompanying chart, any company can quickly analyze its own position in any process or area and take steps to cut costs and boost its productivity by degrees that can be readily realized. Utilization of outside facilities, such as independent research institutions, can be made profitable when studies show them to be desirable.

Technical competence and the forward look in tooling programs can be promoted by association with new ideas in the field, as disclosed in discussions, papers and other literature promulgated by engineering and technical societies. In addition, there is a large body of information available now through machine and equipment builders and more will become available in the future—programs such as the research activities of the ASTE. Current projects include work in the field of plastics, a comprehensive survey of metal cutting, fog application of cutting fluids, cemented borides for cutting tools and punch and die clearances.

## Program for Smaller Firms

The main requirement of any company effort in tooling for tomorrow is that it have continuity. Also, the program must be committed to competent men of vision as a major responsibility. These people must be strategically located so that the ideas they uncover are given full cognizance in the councils of management. Typically, members of a research group are found on management committees, particularly those concerned with forward planning. Without this step, the most ample expenditures in the field of research and development may be virtually frittered away.

The future of engineering science is bright but challenging. Achievements to date are a mere prelude. On the horizon are many new fields for exploitation. These include high-temperature parts, a host of new materials, electro-machining, processing with radioactive materials, chipless production, automatic assembly, automation of forging and mechanization of foundries.

The country is geared to continuing technological advance, as an essential element in its economy. Success will reward those individuals and companies who recognize these facts and press forward with definite objectives.

**Acknowledgements:** The special assistance of the following organizations, as well as many individuals too numerous to mention, is gratefully recognized in the preparation of this article.

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Ford Motor Co. .....Detroit, Mich.
General Electric Co. .....Schenectady, N.Y.
General Motors Corp. .....Detroit, Mich.
General Motors Institute .....Flint, Mich.
Grumman Aircraft Engineering Corp. ..Bethpage, L.I., N.Y.
International Business Machines Corp. ...New York, N.Y.
Minneapolis-Honeywell Regulator Co. ..Minneapolis, Minn.
North American Aviation .....Columbus, Ohio
Remington Arms Co., Inc. .....Ilion, N.Y.
Westinghouse Electric Corp. .....Pittsburgh, Pa.

# Gadgets

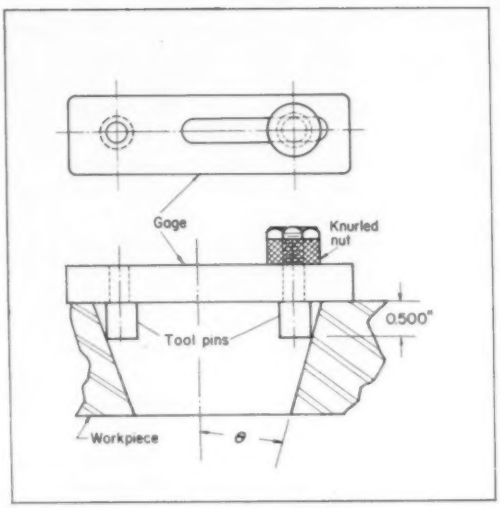
Ingenious Devices And Ideas To Help
The Tool Engineer In His Daily Work

## Tapered Hole Gage

Gaging the large diameter of a tapered hole can be facilitated by the construction of the simple gage shown in the accompanying sketch. The gage consists of a steel bar long enough to bridge the hole with two hardened steel tool pins, one of which can be moved in an elongated slot. The movable pin is tightened in position by a knurled nut.

After the movable tool pin is set in the hole and tightened in position, the diameter can be checked by measuring the distance over the pins with a micrometer. If the pins are 0.500 inch long, adding the tangent of angle $\theta$ to the gage length will give the exact diameter of the taper at the surface of the hole. It is necessary to make the pins of the height shown in the sketch (0.500 inch) in order to apply this method of measurement.

*D. Sweet*
*Marblehead, Mass.*




## RIVETING SOFT METALS

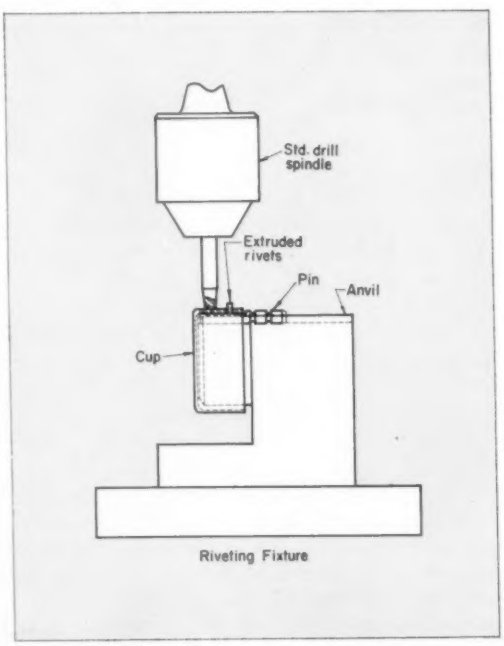
Conventional riveting procedure is sometimes unsatisfactory for handling soft materials. In the case illustrated, material of both the cup and pin to be assembled is of soft silver. Design of the assembly called for the pin to be produced with extruded rivet shanks for mating with holes in the cup.

When the operation was performed in a standard riveting machine the extruded shanks tended to swage back into the pin body, making a poor rivet head and mangling the cup wall.

It was found that by using a drop of lubricating oil on the rivet and rotating the tool in a drill spindle, the extruded shank may be spun into a tight, symmetrical head without distortion of the cup wall. The operation is fast and easily handled by an unskilled operator.

This idea changed a troublesome operation, which had been halted by quality control, into a smooth running, inexpensive process. Quality of the joint, both in rigidity and appearance is excellent. The method may also be used on other soft metals, including sludge metal.

*W. R. Eldridge*
*Little Rhody Chapter*



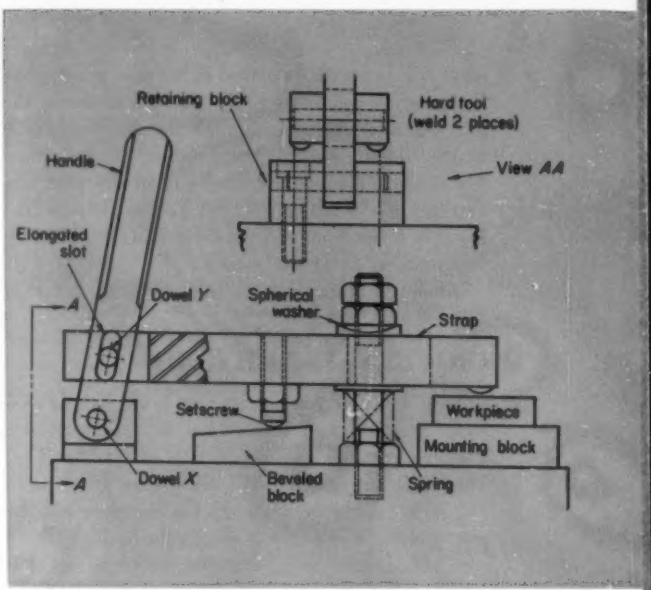
## Novel Clamp Design

This unusual clamp combines several interesting mechanical principles, yet the design is flexible enough to permit many different adaptations.

The handle of the clamp is mounted on a dowel pin, *X*, which is pressed into a retaining block. A slot is provided in the handle for fastening to the strap. This is accomplished by dowel pin *Y*, which is thus free to float up and down in the slot. Two button-like protuberances are provided on the base of the strap for contacting the workpiece. These might simply be a weld bead, as shown, finished to desired shape. A spring-mounted bolt set in a slot holds the strap in position, yet permits forward movement of the clamp. A setscrew and beveled block complete the working parts.

When the handle is moved forward, the setscrew bearing on the beveled block forces the strap against the spherical washer of the mounting bolt, gradually clamping the workpiece against the mounting block. The setscrew provides for minor adjustments.

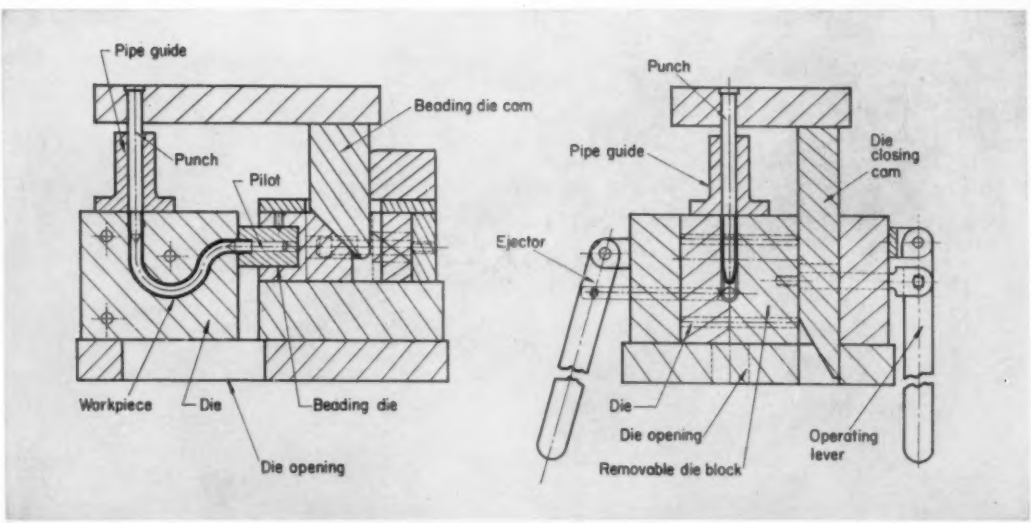
*F. C. Elmo*
*Dayton, Ohio*




## FORMING AND BEADING DIE

In order to form a brass tubular part it was necessary to design a split die for removal of the completed part. Shown in the accompanying drawings is the unusual die design that resulted. It proved successful for this application. As many as 600 pieces per hour are produced with a minimum of deformation, using a 40-ton press with a 7½-inch stroke.

With the split die, a die closing cam is provided as shown in the side view. This assures positive closure of the die during forming. In operation the



stock, cut to length, is placed in the pipe guide when the press is open. As the press ram descends the punch pushes the pipe through the die, forming it to the desired shape. The beading die cam then forces the pilot into the open end of the pipe and actuates the beading die. At the same time the bead is formed on the other end of the pipe by compression of excess metal.

When the ram retracts the operating lever is pulled out to back off the removable die block. The ejector lever is then pushed in by the operator to loosen the formed workpiece. This drops down through the opening provided in the bottom of the die for ejecting finished parts. If desired the retracting die block can be opened and closed by an air cylinder, replacing the hand operating lever.

*G. Lateste*
*Montreal Chapter*

## UNIVERSAL DRILL JIG

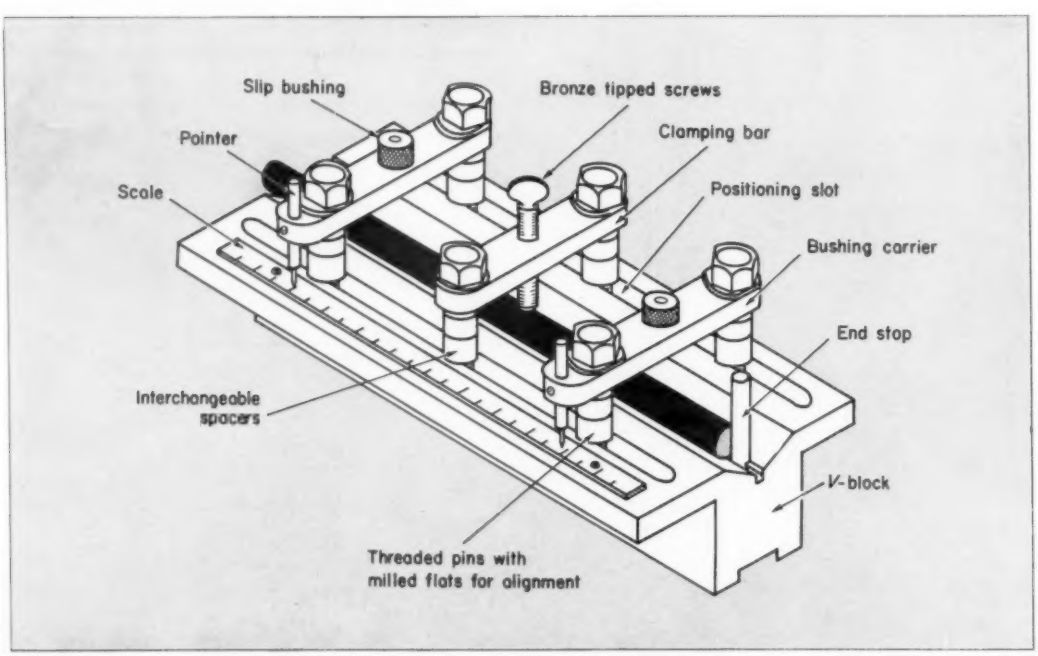
This drill jig for round bar stock has proved itself practical and economical in a shop which specializes in small lot production of great variety. The jig is designed to drill workpieces from $\frac{5}{8}$ to $2\frac{1}{4}$ inches diameter, although the one shown in the photograph handles work of $\frac{1}{64}$ to $\frac{3}{8}$ inch diameter. Minimum center distance between two adjacent holes is 1.062. Greater variety can be achieved by making the bushing carrier plate wider, permitting use of larger bushings. The minimum distance will be extended proportionately, however. Thus the proportions can be varied to suit the size of jobs most commonly handled.

The base is an accurately machined V-block with a locating pin at one end and two slots accurately machined parallel to the axis. This permits the bushing carriers, supported by pairs of threaded pins and spacers, to be mounted in their appropriate locations.

Location of the bushing carriers is achieved as follows. A scale is mounted on the V-block and indicator pins are slid into the bushing carriers. If higher accuracy of hole location is required, indicator pins can be mounted in bushings and centrally located.

By mounting the bushing carriers and clamping bar on proper size spacers, clearance between bushings and workpiece is held to a minimum. A bronze tip on the holding screw prevents marring the work. More than one clamping bar can be provided, if needed, and additional bushings can also be used.

*Fred D. Biddle*
*Philadelphia Chapter*



## Combination Blanking, Drawing, Piercing Die

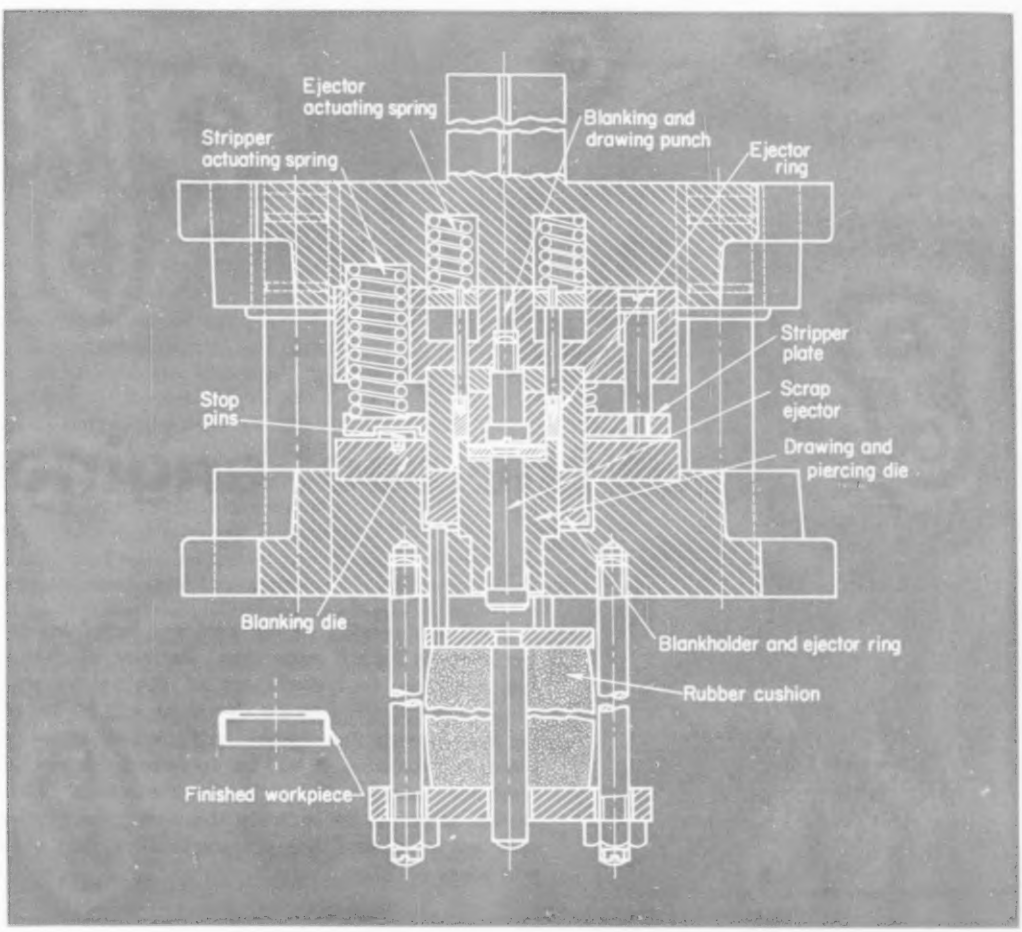
Designed for economical utilization of press facilities, this combination blanking, drawing and piercing die produces a shell for an oil seal at each stroke in a mass production operation. Problems of workholding and ejection, however, were encountered in the design of the die because of the large opening in the bottom of the shell. Reference to the accompanying drawing shows how these problems were solved by using several of the working elements of the die for multiple functions.

In operation, strip material feeding in from the right side registers against a stop pin located in the blanking die. The blanking and drawing punch is one unit so that the drawing operation occurs progressively. Piercing of the center hole is performed with the shell gripped in the draw die.

The stripper plate is actuated by three coil springs. After forming, the finished shell is ejected from the die by the ring which also serves as the blankholder for the drawing operation. Four springs actuate movement of the ejector ring for this purpose. Material from the opening in the bottom of shell is ejected by a separate scrap ejector, actuated by a rubber cushion.

Similar shells can be produced in a single operation in this type of tool if the bottom hole is pierced in the last movement of the press ram, that is when the shell is drawn almost to its full depth. This is about 1/32 to 1/16 inch before completion of the draw, the exact distance depending somewhat on the thickness of the sheet metal.

*Hjalmar Dahl*
*Upplands Vasby, Sweden*



# Responsibilities of the tool engineer

By Robert A. Wason
Associate Editor

**Tool engineering in the past was based on experience or formal education. Because of changing methods, tool engineers of the future will require both. Production decisions will be based on many more factors and with infinitely more possible solutions. It will be up to individual tool engineers to pick the single best solution. This article attempts to indicate the new role of the tool engineer and the responsibilities this role will place on him.**

TOOL ENGINEERS SERVE society, industry, individual employers and themselves. They face a changing set of responsibilities brought about by rapid technical advances, changes in economic patterns and the varying course of sociological drives. At various periods in the past, a company's sales force has been the key factor in company decisions. At other periods, the design engineering department represented the glamorous side of industry. During periods of particular emergency, however, "know-how" became the key. Goods had to be produced quickly and tool engineers were the group who could turn them out in quantity.

The tool engineer is on the threshold of an era where he can act as liaison, with more than implied authority, among company departments. Tool engineers need only recognize their responsibilities and embrace them to have immense impact on the course of future events. The only prerequisites are an adequate foundation and a strong desire to serve. As individuals or as a group, tool engineers cannot stand still. They must progress or, by standing still, they will regress as other groups pass them by. Regardless of individual or title, tool engineering must be done.

### Responsibility to Society

As the tool engineer assumes a more important position in industry, he should broaden his base of activities to include civic responsibilities. His analytical approach to problems is as valuable to the community as it is to an employer even though technical knowledge may not be involved. The tool engineer will add up factors and come to a conclusion rather than look for data that will prove a preconceived notion. Problems based on the same factors will face society in general and industry in particular.

One of the biggest factors and one that can be easily recognized as common to both industry and society is the estimated growth in population, *Fig.* 1. Our population is now growing more rapidly than the available work force. During the decade of the 1950's, *Fig.* 2, total population is expected to increase 16 percent but the work force will only rise 9 percent. In 1956, more people are being supported than are working.

Of the many factors leading to this result, the low birth rate of the depression years is probably the most prominent. There are fewer people in their twenties to go to work. This has reduced the available work force and the high birth rate of the 1940's has rapidly expanded the total population. Add to this, lower infant mortality, earlier retirement and longer life expectancy. World conditions have dictated a policy of strong armed forces and these have drained more potential workers from the civilian work force.

The year 1960 will probably start the reversal of some of the trends that are currently in effect. If the trends do not reverse, at least their rates will not be as widely separated as they now are. The children of the 1940's are now flooding the school system in waves. By 1960, the first of these waves will be ready to enter industry. Then, the work force can, proportionately, begin to catch up with total population. The middle 60's will see a large increase in family units and products for new families will be

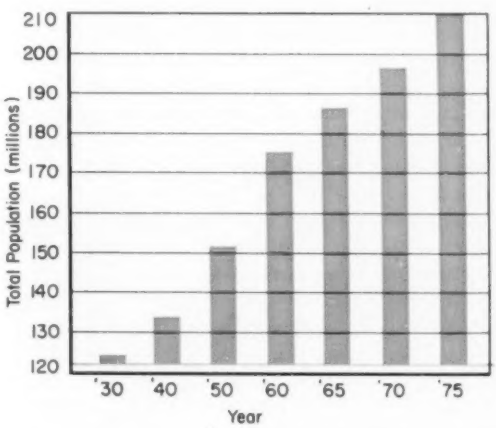



**Fig. 1. Census reports and estimates indicate continued growth in total population.**

in large demand. These must be economically made.

With an increase in family units will come another wave of children. Children will again swell the total population out of proportion to the work force. Without wars or depressions, these population spurts may continue indefinitely. In any event, an oversupply of labor seems improbable.

The high American standard of living would be in serious danger if population trends were the only factor. It has been estimated that with the productivity rate of 1939 every man, woman and child be-

**Fig. 2. Estimated increase in population between 1950 and 1960 indicates that total population will grow more rapidly than the available work force.**

tween the ages of 16 and 60 would have been required to produce the 1955 output. Under these conditions, the work force would be insufficient and the standard of living would drop in a few years.

Fortunately, however, productivity is increasing. Historically, productivity has increased at a steady rate of about 2 percent per year. In recent years, the increase has been 3 percent or more. A difference of 1 percent can have a tremendous impact when it is compounded annually. With a 2 percent increase in productivity, production per man-hour doubles in about 35 years. At 3 percent, it doubles in less than 24 years.

Tool engineers have been largely responsible for this increase in productivity. In light of population estimates, tool engineers must mechanize industry at an even faster rate if the standard of living is to increase. In the future, tool engineers will have to increase productivity per man if the standard of living is to continue to rise at its present rate. Prospects of shorter working hours make this responsibility an even more important one.

In addition to the anticipated shortage of labor, economic factors also indicate that tool engineers must mechanize production. Unskilled muscle power costs over $10 per horsepower-hour at current rates. The same work can be obtained for about 4 cents with an electric motor.

That mechanization will not reduce the number of jobs and cause unemployment can be readily proved. Employment in manufacturing has been rising at an increasing rate even beyond the peak reached during production for the Korean action. This increase is in the area of the economy where automatic equipment is being most rapidly introduced.

Reason for the increase in employment in manufacturing is the growing market for manufactured products. Technological improvements have stimulated this growth by increasing the worker's output and his purchasing power. Designers have introduced product improvements and tool engineers have reduced production costs to further enhance the worker's real wages.

As an important factor in the national economy, the tool engineer cannot help but have a responsibility to society. As his function grows in importance, his responsibilities will also increase. He will understand the results of population changes, productivity increases and technical advances. By recognizing the need for an increasing standard of living and more leisure time, the tool engineer will be ready to accept new civic responsibilities. One of his responsibilities to society will be to remain conscious of possible shifts in employment that could result from major technical advances. He need not slow technological progress but should work with groups who are thinking of employment problems.

### Responsibility to Industry

If productivity continues to rise, employees can shift from essential industries to occupations providing luxury goods and services. A certain amount of flexibility is required so that such transitions can be made easily. Historically, it has been shown that the life expectancy of a declining industry is usually greater than that of the worker engaged in it. Employment shifts are realized not by discharging employees but as a result of loss of attractiveness so that new workers seek employment in industries with brighter futures.

This natural check on disruption of workers takes place because industry cannot apply technical advances as quickly as they are made available. Because of financial problems, equipment cannot be written off the books as soon as it becomes obsolescent. It will be up to the tool engineer to make positive recommendations on the replacement of equipment and indicate when such replacement should be accomplished. Tool leasing programs may do much toward speeding the replacement of capital equipment.

For some industries, new marketing methods

based on new concepts may be necessary before the tool engineer can carry tool engineering to its ultimate goal. Based on the same reasoning as that which led to leasing of capital equipment, some consumer goods may be leased rather than sold. Manufacturers would sell service instead of equipment. As an example, a manufacturer of household refrigerators might want to institute automatic production methods but might hesitate to do so because of the uncertainty of the market. If he could sell home refrigeration service instead of refrigerators, he could control his replacement market and profitably schedule production for automatic processes. Hazards of present fluctuating demand would be reduced to a minimum.

In industry, the tool engineer has a responsibility for making his professional function known, understood and respected. With the increase in mechanization, the technical responsibility of the tool engineer has increased many fold. He has reached the position where he does engineering in every sense of the word. Because of legal aspects attached to the word "engineer," tool engineers are responsible for enhancing the engineering profession and gaining the recognition and confidence of the public.

As a professional, the tool engineer should strive for the free interchange of information that will help him do a better job. Information can be quickly disseminated through technical society papers and in technical magazine articles. Out of responsibility to his employer, the tool engineer should acquire as much information on current practice as he can.

Through responsibility to the profession and industry, he should convince management of the desirability of contributing to the free flow of information. His company will not lose a competitive position. Rather, it will benefit many times over because of the availability of more production data.

### Responsibility to Employers

Because production methods now require skilled operators it is imperative that those who influence the work force should increase their skills as well. Personal development and increased professional stature will be required to maintain an efficient and harmonious organization. Such growth will lead to administrative responsibilities.

Top tool engineering management, regardless of titles, should consider accelerated training programs within their own companies. The beginning tool engineer is handicapped because of the limited availability of sufficiently advanced courses in tool engineering and subjects in related fields.

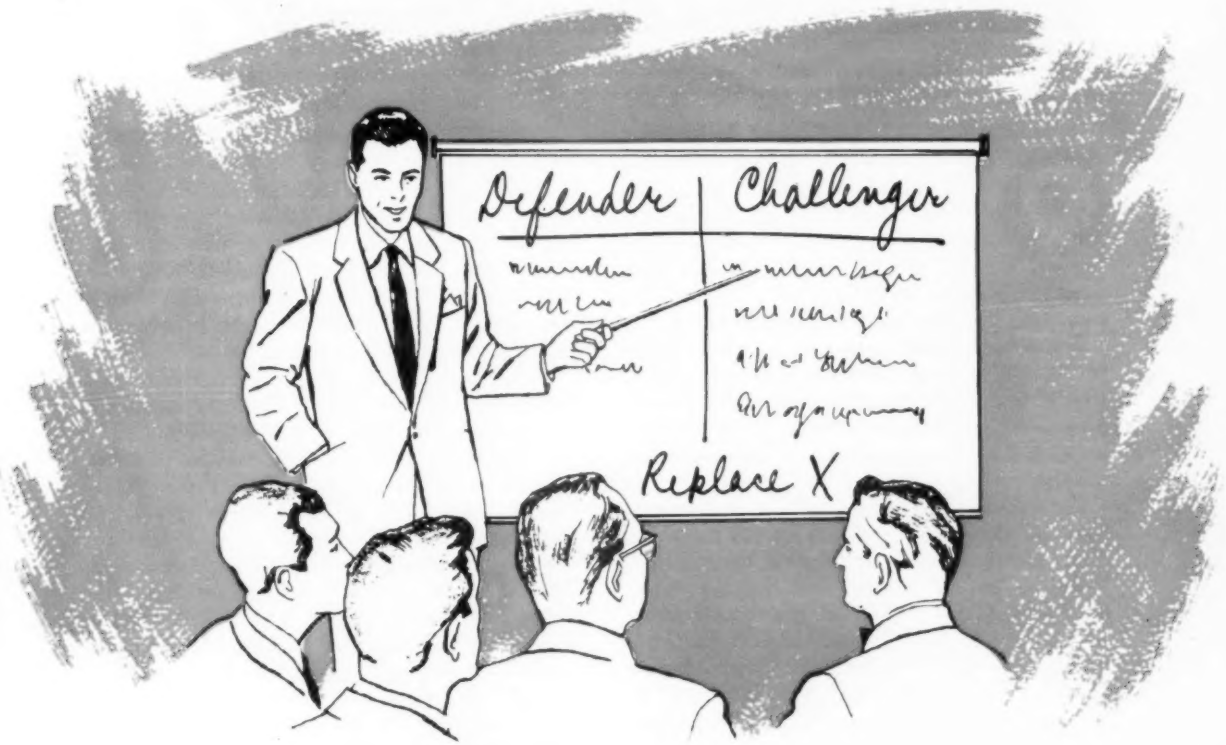



**Fig. 3. Company-sponsored training programs can rapidly increase the value of individual tool engineers.**

—Photo courtesy Clark Equipment Co.

**Fig. 4. Tool engineers have large responsibility in deciding when plant should be expanded and what facilities should be added.**

In addition to stressing professional development, such training programs should provide for a fuller understanding of company operation, *Fig.* 3. Talks presented by the purchasing agent, chief design engineer and technical specialists will quickly acquaint the tool engineer with other functions that must mesh with his own. An understanding of sales problems could add perspective to technical ability.

Beginning engineers cannot just wait for training programs to happen. They must gain professional stature as quickly as possible. Through available information media and by participating in technical societies, the novice can quickly broaden his understanding.

The responsibility to his employer of the established tool engineer is to put into practice the motto, "Make more goods for more people at less expense." To do this, the tool engineer must continue professional advancement and put into practice new methods that apply. Directly and indirectly he is responsible for the expenditure of large sums of money. These must be wisely spent if a profit is to be made and the company is to remain in existence.

Over the years, industry has plowed the equivalent of $\frac{1}{15}$ of its output back into the business. This is an investment that has paid off in the past and future investments must continue to prove economical. Capital goods are the creative property of industry. Their wise selection and operation is responsible for rising productivity and a rising standard of living. As more and more types of equipment and processes are available, the more important is their selection. Tools purchased for a particular project today should have some value tomorrow.

In the past, capital outlays have not only risen and fallen with production, they have intensified the business cycle by falling deeper and rising higher. Capital goods were formerly classified as added capacity or replacement, but with the capital equipment now available, every replacement adds to capacity and machines bought for added capacity involve some replacement. The tool engineer should consider himself partially responsible for influencing design of capital equipment. Because he is responsible for its use, he should emphasize machine operations by making known his needs to machine builders and designers.

Plant expansion is one area where the tool engineer can readily increase his value. Because of his position in manufacturing, it is really his responsibility to contribute heavily to the thinking

that leads to the decision to add to plant. Once the decision is made, it is the tool engineer's responsibility to implement it, *Fig.* 4. To make such decisions, the tool engineer should have a foundation knowledge of all alternative methods of manufacture. The tool engineer's education is never complete. He should learn something new from every job he does. If he doesn't, he is standing still.

A rise in the productivity of any segment of the economy usually means a corresponding rise in wage levels throughout all of industry. General wages may rise more than the national rise in productivity. Since wages are basically out of control of individual companies, they maintain a competitive position by further improving their own productivity.

This is where tool engineering comes in. Tool engineers must create new machines or new combinations of old machines to do jobs formerly done by people. This competition between wages and machine utilization is healthy. It has been responsible for the big advances in manufacturing techniques. It does not lead to unemployment. In plants where mechanization has been most concentrated, total employment has increased.

In the future, his expanding responsibilities will put the tool engineer higher on the management team. He must understand corporate structure and should be able to discuss company problems with other personnel in their own terms. Already, some companies have turned to the committee approach to solution of company problems and the setting of company policies. New product conferences are attended by representatives of sales, engineering, production, administration, purchasing and finance.

Salesmen explore the needs of the market and can report to the planning committee the requirements for competitive products. Designers can propose new materials, new functions, new styling and new approaches. Purchasing men can report on availabilities of materials, stock, components and services. The tool engineer must be able to evaluate the reports of all the others in terms of plant available to do the job, *Fig.* 5. He must know whether current plant can be used for proposed material. He must be able to point out design changes that will result in drastic production expense reductions.

When the time comes to convert desires and ideas into products, the tool engineer is in the driver's seat. To stay there, he will have to be professionally competent and he must be able to think in terms of other people's problems. He will have to prove to financial people that a new machine will be required to work the materials specified by the engineering department. He will have to learn company politics and achieve a personal polish that was not normally associated with tool engineering before.

Ordinary professional development will lead the tool engineer into correct application of production equipment once he has it, but a tool engineer's responsibilities will go deeper into maintenance than they have in the past. Automatic equipment is subjected to heavier duty cycles because of its nature. With mechanisms that were only lightly strained in the past, industry has been able to get by with a minimum of maintenance. Today it is a different story. Maintenance must be planned, and it must be planned by the same responsibility that plans production.

Preventive maintenance is a method of controlling outages through the planned application of men, materials and tools to help protect capital investment, increase production and lower product cost. By substituting planned short-time shutdowns for unscheduled breakdowns of undetermined length and seriousness, actual down time per year can be reduced. This adds plant capacity without adding more machines.

As production processes become more complex and are tied closer together, down time becomes progressively more serious. Because of the vast sums of money involved in automatic production equipment, designs are made only after full realization of eventual use. Machine manufacturers specify lubrication and maintenance schedules and these must be adhered to if breakdowns are to be avoided. Adding to the problems, safety factors used in machine design are becoming lower, and rightly so. There is no need to build a unit capable of performing an operation 50 percent more strenuous than it will ever be called on to perform. With greater knowledge of materials characteristics and properties, with greater understanding of force systems, and with new measuring and testing equipment, designs can more accurately meet the requirements. This is just another economical step, but it adds to the tool engineer's responsibility for proper application and maintenance of capital equipment.

As the complexity of manufacturing processes increases, the responsibilities of the tool engineer will continue to increase and broaden. As the tool engineer's responsibilities broaden, his value to his employer will increase.

### Responsibility to Himself

In preparing himself for his responsibility to society, industry and his employer, the tool engineer will also satisfy his responsibilities to himself. He will take advantage of every aid that is available to him. The tool engineer of the future, as with the tool engineer of today, must have experience, education and adaptability, and be well versed in the economics of manufacturing. His formal education and his practical experience will go hand-in-hand because without the one, the other has limited value, both to himself and to his company.

—Photo courtesy Fisher Body Div.

**Fig. 5. Tool engineers will come into closer contact with designers, purchasing men and management, and will have to express production needs and limitations in terms the others can understand.**

Adaptability is necessary for any individual so that he can fit into the situation in which he finds himself. When adaptability has been developed to a high degree, the individual can help alter the situation to his own advantage and to the advantage of those to whom he is responsible. The tool engineer will have to be adaptable to changes in technology and changes in personnel. Adaptability of this type can be a forerunner of increased creative ability. An orderly thinking process and the ability to weigh all factors of any situation or problem provide for progress and flexibility.

As progress is being made toward larger and larger machines and tools, so is progress being made toward smaller and smaller components. All of this progress introduces new concepts that tax the untrained mind. As the fund of knowledge builds up, the tool engineer will have to compromise. He must know all there is to know about production processes; he must understand the availability of control equipment and special branches of engineering. He cannot expect or be expected to fully understand the entire scope of technical information.

The tool engineer will apply components without understanding the theory of their operation. He will know inputs and outputs. If he realizes that electronic controls can increase accuracy, reduce costs, speed operations and provide more information, he need not understand electron theory. If he knows service life, characteristics and maintenance requirements of electronic controls, that will be sufficient. If he realizes that nuclear energy will provide him with new sources of power, he need not understand nuclear principles.

Tool engineers have always had multiple responsibilities. Many tool engineers of today are already conscious of their changing position as it is being brought about by new production philosophies. It has been the purpose of this article to summarize, and perhaps add some perspective to the responsibilities that will result from the forward progress of science and industry.

**Acknowledgment:** The author wishes to thank the Field Editors of THE TOOL ENGINEER who have contributed concrete ideas on which to base this article. Also, some of the statistics used in the article represent data based on Census Bureau figures published by the Council for Technological Advancement.

# brazing with silver alloys

## *helps solve tricky production problems*

**By Allen W. Swift**

**Service Engineer**
**Handy & Harman**
**New York, N. Y.**

WITH PROPER FIXTURING and a correct amount of heat, a wide variety of ferrous and nonferrous metals can be brazed economically to meet unusual production and quality requirements. These requirements may range from precisely aligned parts to the tricky problem of brazing various gage metals where both precision and appearance are essential.

To illustrate the versatility of brazing with silver alloys, four case histories have been assembled, each representing a different production requirement. These illustrate: (1) "precision" heating to braze light and heavy gage materials together; (2) fixturing and heating to produce precision alignment on a high-production basis; (3) stepwise brazing involving odd joint angles; and (4) high production brazing of hard-to-handle tubing and castings.

**Precision Brazing:** Making the five joints in the assembly shown in *Figs.* 1 and 2 would seem to be a simple affair. The frame assembly is part of a soda fountain syrup pump and consists of four stainless steel components: (1) a 0.037-inch thick rectangular cover; (2) a tube for syrup with a 0.035-inch wall; (3) a 0.250-inch diameter solid support rod and (4) a 0.093 inch thick circular cup cover.

Careful heating techniques had to be devised because of the various gages of these parts, and because stainless steel is a relatively poor heat conductor. This was to avoid distorting the thin gage parts, and yet supply enough heat to make strong, uniform, filleted joints to meet rigid sanitary requirements.

Several heating methods were tried before the present production method was adopted. These included furnace brazing in a controlled atmosphere, and a molten salt bath. None of these methods consistently produced uniform joints and distortion-free assemblies. Finally, hand torch heating using preplaced rings of Easy-Flo 45 silver brazing alloy was adopted. Careful heating and good fixture design are the major factors in brazing this assem-

**Fig. 1. Uniform heating is required to prevent distortion of thin members. Wire in operator's left hand helps keep the rings seated against the pump cover.**

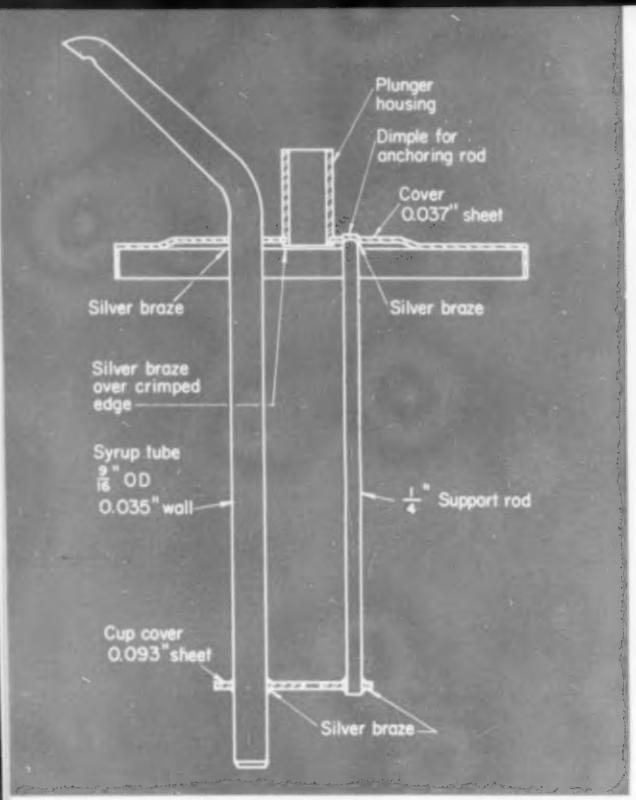



**Fig. 2. Frame assembly of a syrup pump, showing the varying gages of the four major metal components.**

bly without distorting the thinner members. The fixture is designed to support, but not grip, the tube and rod so that they can expand freely when heated.

Fluxing and brazing is done as the assembly rotates at about 15 rpm on a 7-inch turntable. The operator first fluxes the assembly, covering all surfaces of the rectangular cover as well as most of the tube, the rod and the circular cup cover. This lavish use of flux more than pays for itself by forming a protective coating on the steel, preventing discoloration that otherwise would have to be removed with a costly hand finishing operation.

As the work rotates, the operator heats the work with an oxyacetylene hand torch. The use of a multiple jet tip produces a soft reducing flame, *Fig.* 1, avoiding overheating the metal and exhausting the flux too rapidly. The operator's skill and the steady rotation of the turntable are the keys to distributing the heat evenly.

The most difficult joints to braze are the three on the rectangular cover, one of which is a pierced joint. As the work rotates, the operator plays the long, bushy flame in a constant up-and-down motion for a short distance along the rod and tube. Because of their different masses, the heavier pieces must receive relatively more heat than the thinner pieces in order to bring all pieces to brazing temperature at the same moment. It is especially important to heat the thin gage cover evenly, for any local overheating would immediately cause distortion. The operator watches carefully for the first signs of distortion and applies additional heat to the proper area to equalize the stress. When these joints are completed, the operator brazes the two remaining joints on the cup cover below, using the same technique.

The entire brazing cycle takes seven to ten minutes, obviously not a high production rate. Nevertheless, this method has proved the only practical way to obtain joints of uniform strength and good appearance on expensive parts, while eliminating rejects and excessive finishing operations.

**Fixtures for High Production:** On a gear shifter assembly for a home washing machine, the combination of induction heating and ingenious jiggling delivers better than 200 critically-aligned assemblies an hour.

The assembly consists of a shaft and a stamped fork, one end of which fits into an annular groove machined midway on the shaft, *Fig.* 3. The parts are assembled by hand, fluxed, and a two-thirds ring of 0.03125-inch diameter wire is placed against the joint. The assemblies are brazed two at a time in a two-station induction heating unit.

Specifications require that the face of the fork shall be within 0.008 inch of parallel with the sides of the annular groove. A special fixture is used for this purpose. The shafts are placed in a verticle position with lower end protruding through a hollow plug, and with the face of the fork resting against the surface of the plug. The shafts are held also at the top by two light compression springs which press the shoulder of the groove against the fork and thus, keep the two in proper alignment. As soon as the fixture is loaded, the operator energizes the unit which heats the two joints for an interval of 7½ seconds. When the automatic timer shuts off the current, the operator removes the assemblies with a pair of pliers and quenches them in hot water for easier flux removal, *Fig.* 3. With this setup, the operator produces more than 200 perfectly aligned gear shifter assemblies an hour.

**Odd Joint Angles:** To form the spout assembly of a mixing water faucet, a boss and sleeve are brazed to opposite ends of a drawn tube, at an odd angle. The sleeve and boss are brass screw machine parts. The tube is drawn brass, flat on the bottom and sides, but crowned on top.

It is essential that the joints between the three parts be not only tight, but also strong and corrosion resistant—strong because the assembled spout is likely to sustain occasional impact in service and corrosion resistant because corrosion might weaken the joints or destroy the plating subsequently applied. Also, the fillets must be uniform to present

a smooth surface for plating.

Heat is supplied by a pair of opposing burners fueled by a gas-air mixture. The boss and sleeve are brazed to the ends of the tube in two separate operations at consecutive brazing stations. The spout tube and boss assembly is made with the parts inverted, as shown in *Fig.* 4. During assembly of the parts in the fixture, the operator preplaces the silver filler metal, consisting of a 0.005-inch shim of silver brazing alloy in the vertical face between the end of the tube and the bass. Then, an arc of 0.042-inch diameter wire is placed where the semicircular lip of the boss rests on the bottom surface of the tube.

By means of a wood handle attached to the fixture, the operator pushes the work into the heating area. While one assembly is being heated, the operator assembles another set in a second fixture to insert into the burners as soon as the first operation is completed. At each brazing station, there is a flat plate having guide rails so that the fixture is perfectly positioned between the burners as it is pushed into heating position.

All the alloy is drawn uniformly into the joint by capillary action, but there is a calculated excess

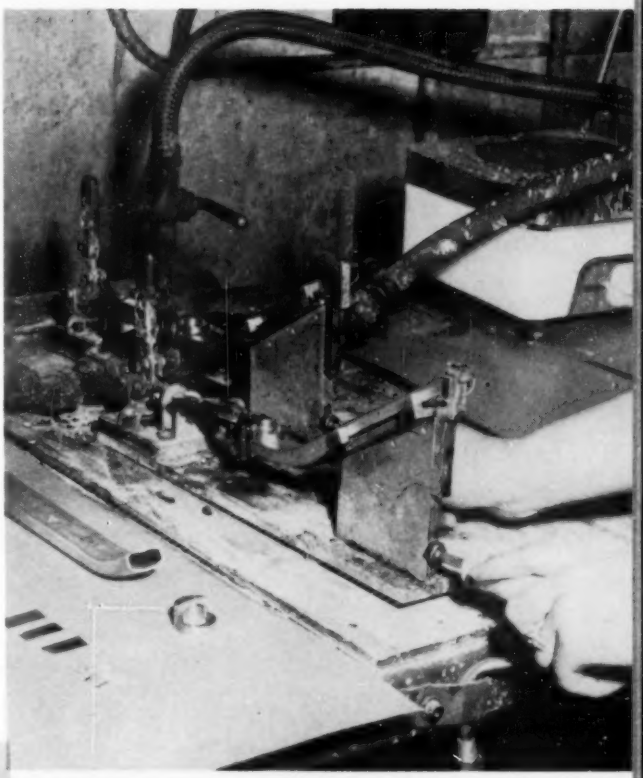


**Fig. 3. (below) Induction brazing machine in which gear shifter assemblies are brazed two at a time. The assemblies are shown on the table.**

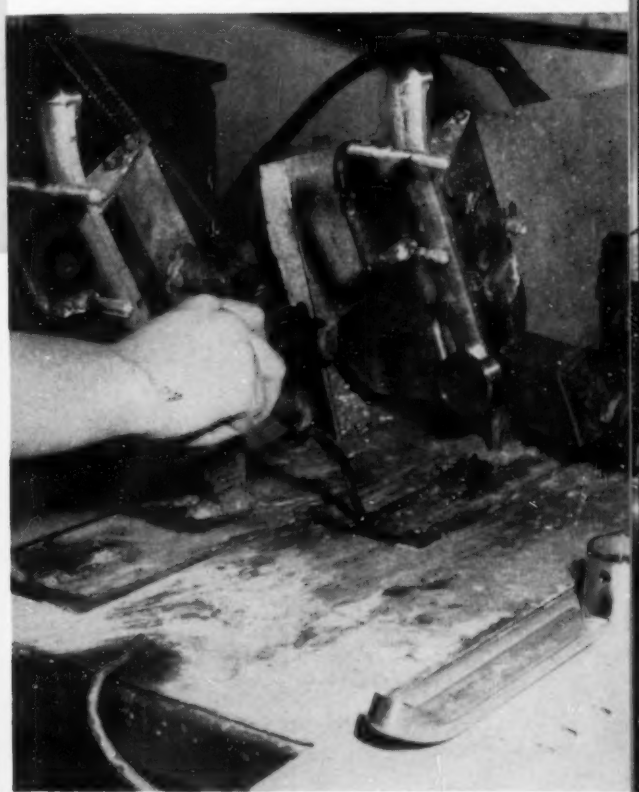
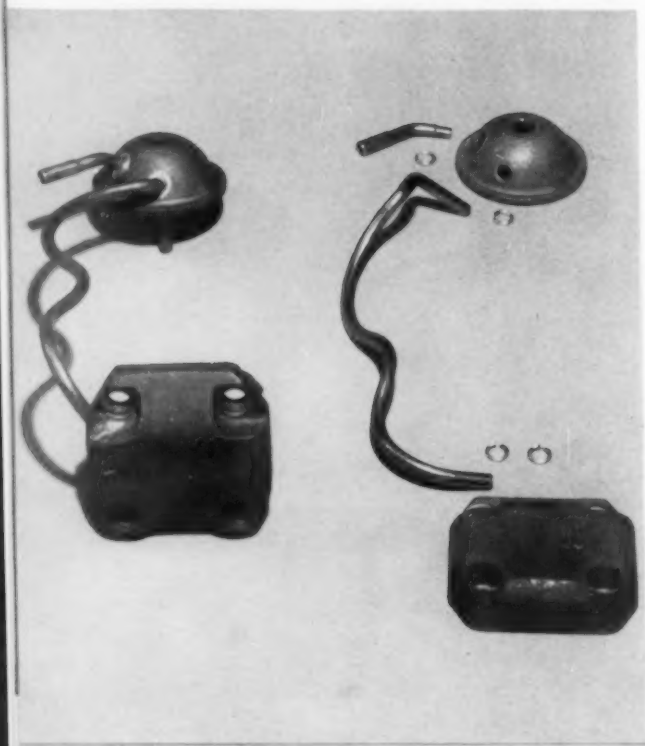


**Fig. 4. (upper right) Fixture and heating arrangement for brazing a water faucet. This operation joins the spout tube to the boss.**

**Fig. 5. (lower right) Sliding plate and wood handle fixture position the work for joining the spout assembly to the valve sleeve.**



of metal so as to leave a fillet between the surface of the tube and the boss. This is for easy buffing and uniform plating. It also eliminates crevices in the interest of cleanliness in service. After buffing and plating, this joint is invisible.

For joining the other end of the tube to the cylindrical sleeve, *Fig.* 5, the joint is made at an oblique angle. The end of the tube is cut to fit the sleeve at this angle and the fixture locates the end end of the tube precisely over the exit hole of the sleeve. Thus, when the locking clamp is closed, the parts are in perfect alignment. In making this joint, the operator places the length of silver alloy wire against the joint seam but inside the tube. By doing this, the operator can see that he has obtained a solid joint by observing molten alloy emerging to the outside of the joint. Also, any excess alloy is eliminated under the joint seam where the narrow re-entrant angle makes polishing difficult.

**Hard to Handle Assemblies:** High-volume production of a hard-to-handle muffler and header subassembly for a refrigeration compressor was obtained through the use of an automatic brazing station. The subassembly, *Fig.* 6, consists of two lengths of copper-on-steel tubing brazed to two

**Fig. 6. (above) Muffler and header assembly are brazed simultaneously in three places.**

**Fig. 7. (below) Setup crew assembling work on a fixture (at left) before sliding it along track on the assembly table to the station where it is loaded on the brazing table.**

cast-iron pieces. The automatic brazing setup increased production of these parts substantially by making all three joints simultaneously.

Cast iron is generally tricky to braze because it often contains graphite which inhibits the wetting action of the brazing alloy, thus preventing a good alloy to metal bond even with proper fluxing. This problem has been overcome by degraphiting the castings by the Kolene process. This removes enough graphite from the surface of the metal to assure good adhesion of the alloy. After this operation, the brazing can proceed normally as with other metals.

Silver alloy rings 0.1875-inch in diameter are placed over the ends of the copper tubing. The tubes and castings are assembled on a fixture, *Fig.* 7, and passed along a track on the worktable to a point where flux is applied to the joints before being loaded on a brazing rig. The fixtures are mounted on angle bars fixed to the table. The table, which is advanced periodically by an air-actuated ratchet, revolves the subassemblies through 12 sets of burners, *Fig.* 8. Each set consists of three gas-air burners: one multiport flame retention burner which heats the assembly from above, and two ceramic-lined burners which heat from below. The multiport burner and one of the ceramic-lined burners are trained on the heavy casting to bring it up to temperature at the same rate as the lighter, dish-shaped casting.

The table indexes every 18 seconds, moving two assemblies into the burners and two out each time. Each assembly makes six heating stops before passing through the semicircle of burners. This number of stops provides adequate heating time with lower flame temperatures. As the brazed assemblies are removed from the table they are quenched to cool the parts and dissolve the flux. After quenching, the assemblies are removed from the fixtures and the fixtures returned to the table for reuse.

Formerly the muffler and header assembly was produced by four teams of two men, one making the setups, the other brazing them by hand torch. Each team turns out about 100 assemblies an hour, a total of 400 for the 8-man crew. The automatic setup, on the other hand, delivers the same number of assemblies per hour using only 4 men.

**Summary:** No analysis of a subject that is continuously being improved can hope to be complete. Most operations are put into effect only after numerous trial and error tests in which a method of joining metals by brazing has proved efficient to the individual manufacturer and his individual problem.

These are but a few of the histories where production has been increase by taking advantage of the speed, low cost and versatility in joining metals with silver brazing alloys.

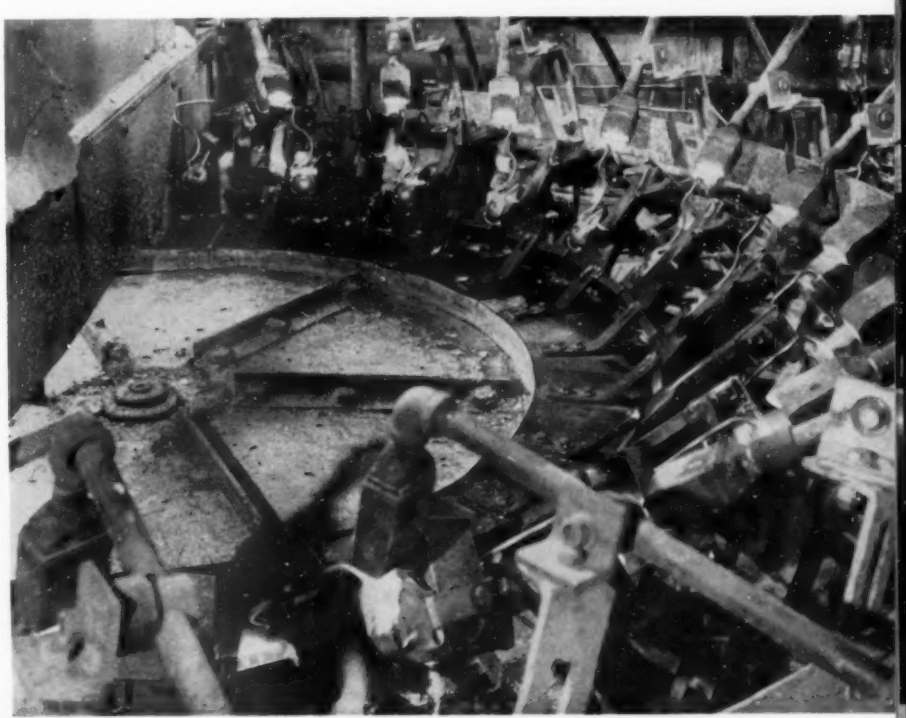


**Fig. 8. Rotary brazing table where muffler and header subassembly are brazed. Two assemblies are completed every 18 seconds.**

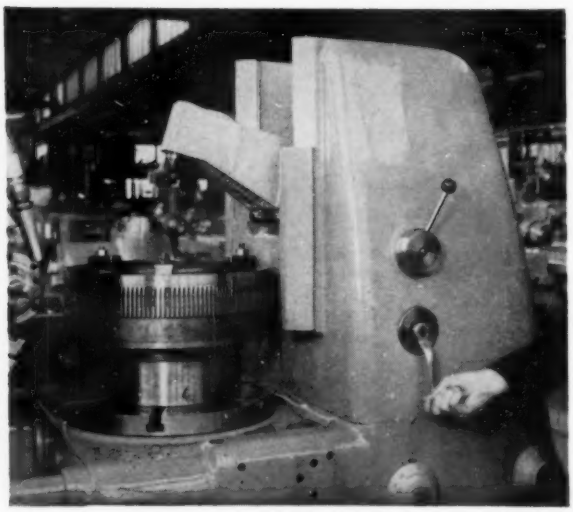
# *designed for* PRODUCTION

**Additional information will be available on all of the equipment described in this section at the ASTE Industrial Exposition to be held in the International Amphitheatre, Chicago, Ill., March 19-23, 1956.**

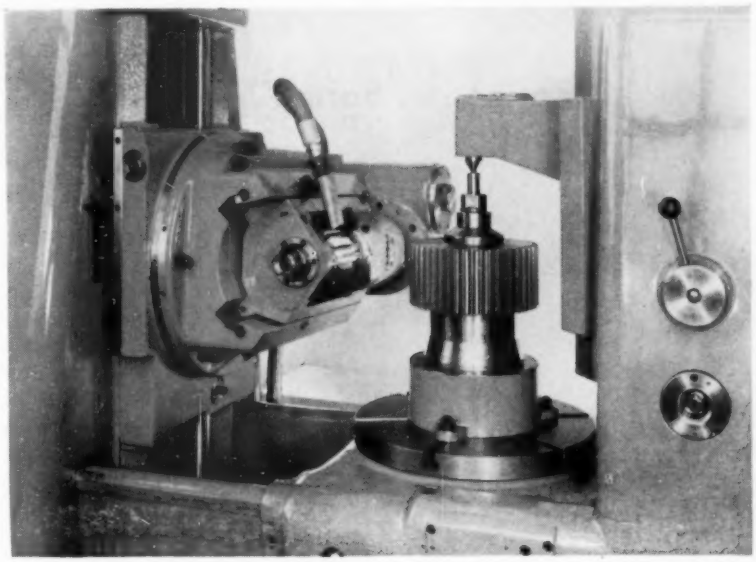
## High-Speed Hobber Cuts Large Gears

HOB SPEEDS and all feeds are selected by turning dials on the control panel. Change gears, required only for indexing and differential, are grouped in a single gearbox. Tooth depth is set by dial rather than stops.

Engineered for the production of large gears at high speeds, this hobber introduces diagonal hobbing. This method of hobbing increases tool life at high speeds. With diagonal hobbing, special hob-shifting attachments are unnecessary. This machine, built by Pfauter Machine Co., Riverdale, N. Y., also has dual-lead worm gear drives for table and hob spindle, and hydraulic backlash prevention. The latter feature makes climb hobbing efficient by counterbalancing the hob slide.



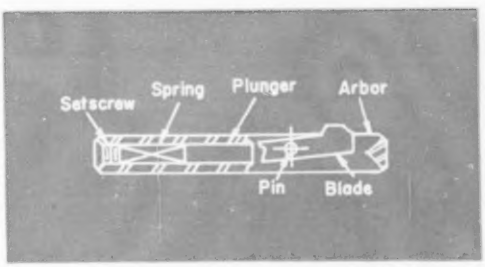
RIGID DESIGN and construction of machine are typified by work arbor which is designed as a second column. Overarm is unnecessary with this design.



UNIVERSAL HOB HEAD for longitudinal hobbing of spur and helical gears and tangential hobbing of worm gears. Both hob directions can be combined for diagonal hobbing. After workpiece is loaded, automatic work cycle comprises: rapid approach, plunge cut to tooth depth, change to longitudinal cut, and fast return of work and hob to starting positions.

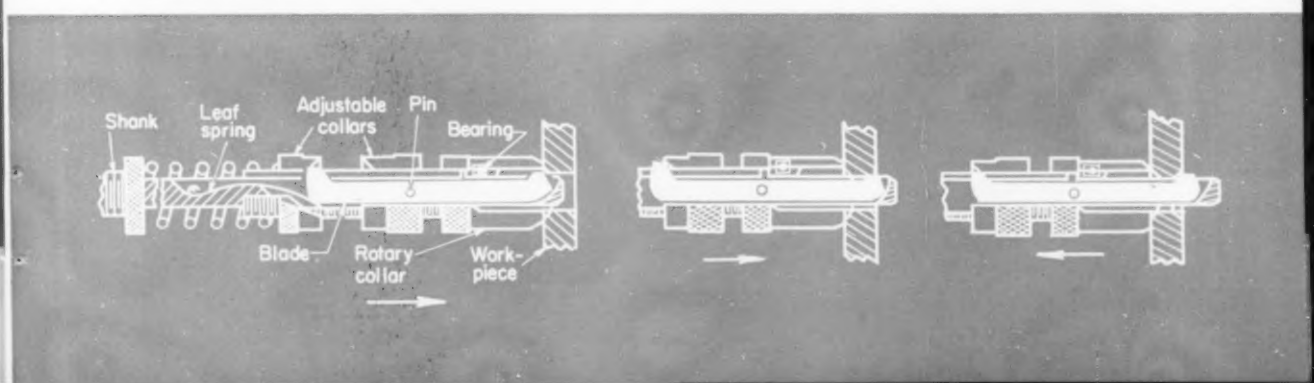
## Tool Deburrs Both Edges of Hole

Where either the top or bottom surface of a part containing a hole is inaccessible, this tool can be used to deburr and chamfer the top and bottom of the hole from the accessible side of the part. Also manufactured by Cogsdill Tool Products, Inc., Oak Park, Mich., another model of this basic tool includes adjustable collars to individually adjust the depth of cut both entering and retracting.



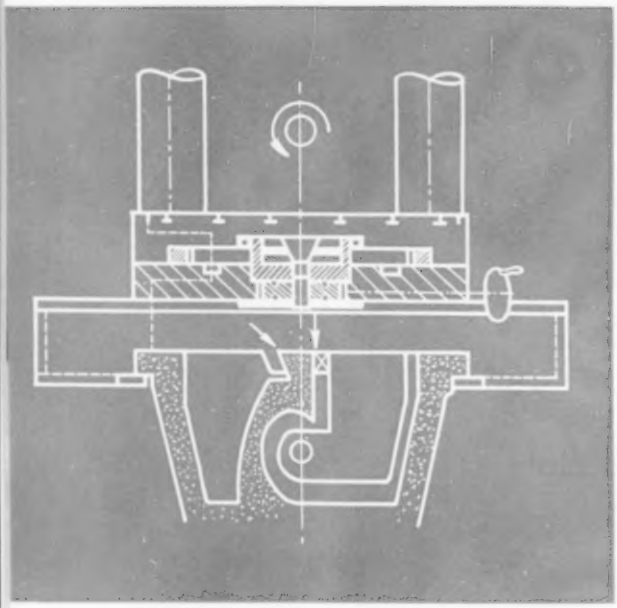

DEBURRING TOOL uses a spring-loaded blade that deburrs the front face of a hole during the collapsing action caused by contact with the part. Top of the blade is highly polished and crowned to prevent damage to the hole wall as the tool passes through. The spring then forces the blade into cutting position for deburring the back face.

CONTROLLED chamfering operations are accomplished by the blade of this tool which is actuated by two independently adjustable cam collars. Each collar controls the amount of chamfer on one side of the hole. Duplicate parts can thus be produced with identical chamfers.



# DESIGNED FOR PRODUCTION

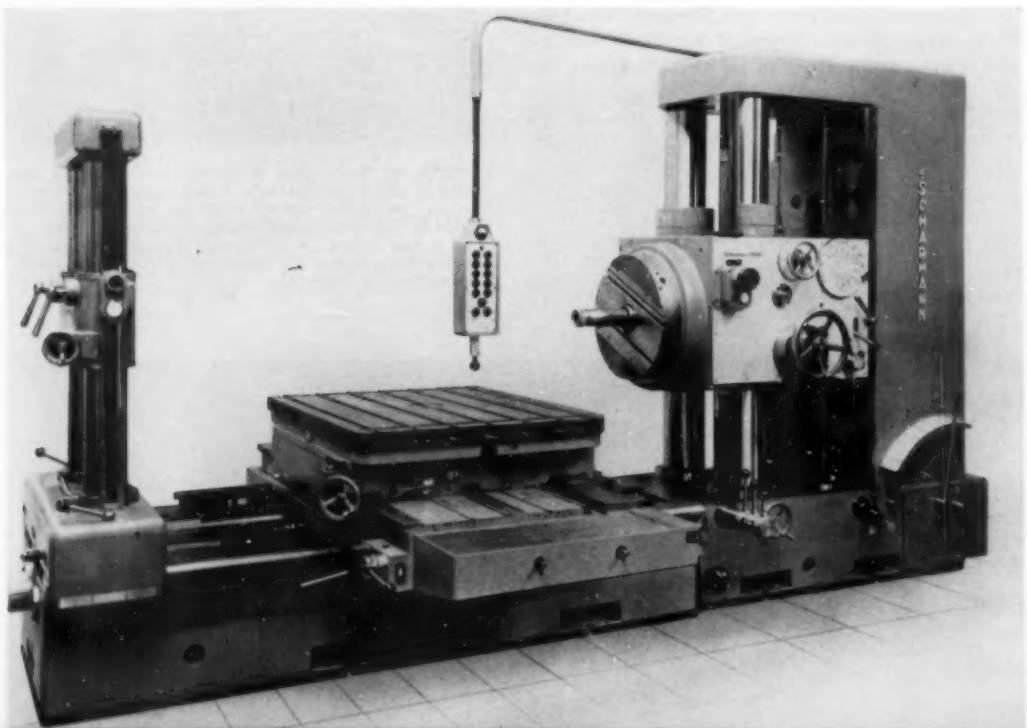
## Horizontal Boring Machine Designed for Rigidity



Departing from the accepted method of hanging a heavy headstock on flat ways on the side of a column, this machine uses round columns through the headstock so that the spindle is equidistant from the supports. This prevents twisting of the headstock and deflection of the boring spindle. The headstock of this machine, built by Scharmann Machine Corp., Pittsburgh, Pa., is further guided at the rear of the arm on a special gib in the conventional, cast column. In effect, this provides three-point suspension.

BORING SPINDLE is carried between two round columns to divide load. Guide at back of bar extension housing prevents twisting.

ENTIRE TABLE is supported on the surface of the slide, which is of the same size, and together they rest on the bed as a rigid unit. Bed slide is carried on flat ways and the central dovetail way guides the table to prevent table rising.

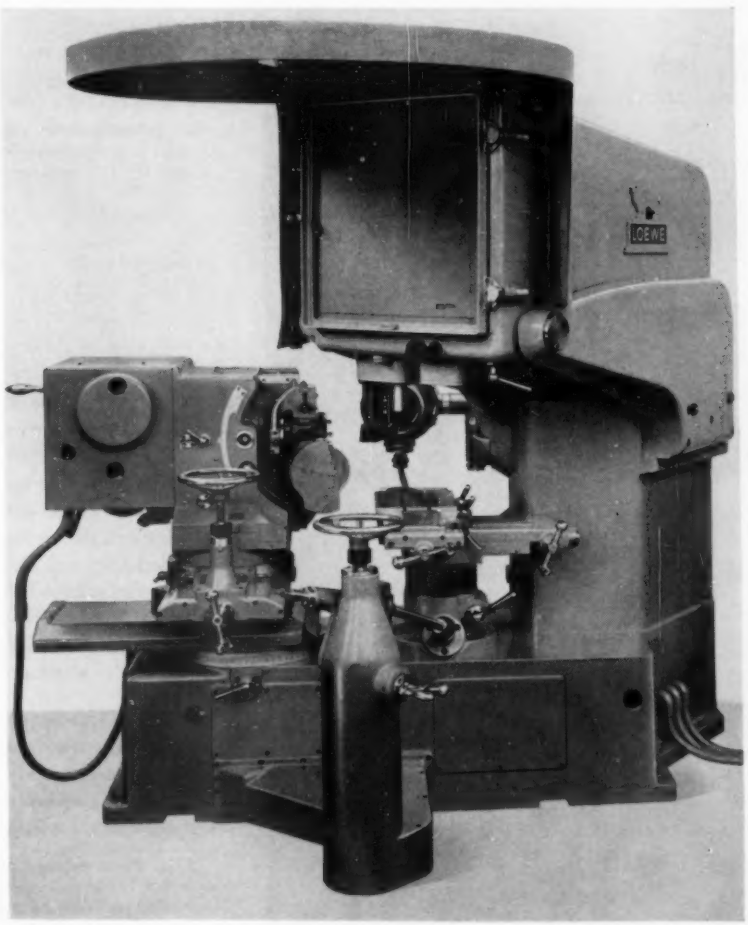


# OPTICAL PROJECTION PROFILE GRINDER

## *shapes by shadow or reflection*

Combination of a precision form grinder and a profile projector, this machine permits finish grinding direct to a drawing. The optical system, which is arranged for magnification of 25 and 50 times, shows the profile with an accuracy of ±0.00012 inch when lower illumination system is used and ±0.0002 inch when upper illumination is used.

This Loewe grinder, handled by Eric R. Bachman Co., Inc., Long Island City, N. Y., has a 19¾ inch square viewing screen that will cover a working area of ¾ by ¾ inch at 25X or ⅜ by ⅜ inch at 50X. For larger workpieces, table position is adjusted accurately with gage blocks to locate the part so small areas can be ground to a special layout drawing. Individual areas must be within ¾ or ⅜ inch on any side, depending on magnification used for the particular operation.




LOWER LAMP gives a standard shadow of the part and grinding wheel on the screen. The upper lamp is used for reflected views when the workpiece shadow would block the working area. Since the grinding wheel is not visible by reflection, points of contact are indicated by projecting a reproduction of the wheel with a phantom arrangement. In some operations, both light sources are used at the same time.

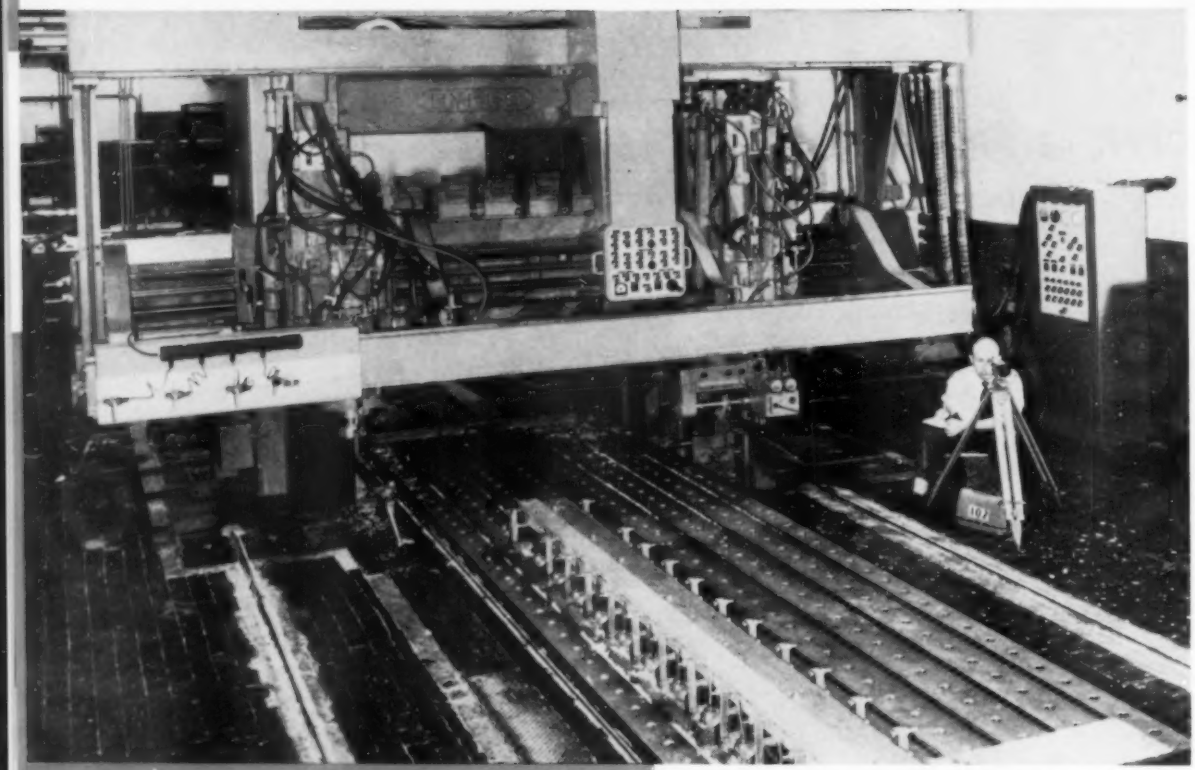


Fig. 1. Setting up a mill with the aid of a precision level. Conventional leveling methods proved inadequate for the accuracy required.

# ALIGNING LARGE MACHINES

## *with optical tooling*

**By Harold H. Poett***

**Optical Tooling Engineer**
**Manufacturing Engineering Div.**
**Grumman Aircraft Engineering Corp.**
**Bethpage, N. Y.**

LARGER AND LARGER MACHINES are being required for machining huge parts such as forgings, skins and spars for modern aircraft. Aligning and leveling the beds as well as squaring the columns of some of these large machines poses problems to plant engineering and maintenance. Levels, transits, precision bubble levels, and parallel bars that have been used in the past are inadequate in the setting of some of these machines. The application of optical tooling has proved to be a logical method. A typical application is the leveling of the spar mill illustrated in *Fig.* 1.

**Leveling:** Levelness is one of the basic requirements of many machines. The precision level picked for this job employs a built-in optical micrometer and prismatic leveling system whereby the ends of

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**Senior member of ASTE Long Island Chapter**

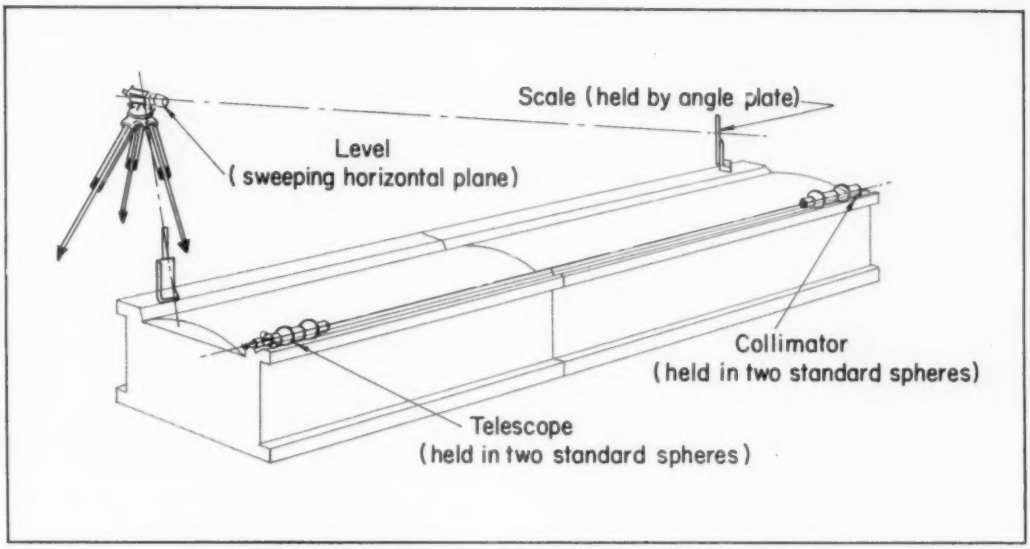



**Fig. 2. Method for setting sectional beds for levelness and alignment. The collimator is slid along the V-ways to observe displacement and tilt.**

the leveling bubble are brought into coincidence when the instrument is precisely level. Horizontal displacement of a target can be checked to ±0.0005 inch at 25 feet. These readings can be repeated and read directly on the optical micrometer scale. The range of the optical micrometer of this instrument is ± 0.250 inch. It is equipped with a 42X inverting eyepiece.

**Aligning:** In order that spar mills, planers and skin mills run properly, it is essential that each section of their beds be perfectly aligned. In some cases this is even more important than levelness. For this operation, an alignment telescope with a 45X eyepiece and a collimator are often used. The telescope is mounted in two standard spherers, *Fig.* 2, and the collimeter target is also mounted in two spheres. When the latter is slid back and forth along the V-ways of the bed, alignment and displacement of the beds are checked at the same time with the instruments.

A preferred method of setting beds is to use an alignment telescope on a special stand, away from the end to be aligned. *Fig.* 3, and two illuminated targets in standard spheres on the ways. The telescope with a 45X magnification eyepiece is mounted on a low stand to align with the targets. An alternative method of leveling uses a prismatic stride level on the alignment telescope to establish a level plane. Both vertical and horizontal displacement can be read directly on the optical micrometer of the telescope.

The alignment telescope, with or without stride level, must be "bucked in" to the near and far end targets on the bed or beds. The targets are then moved along the beds, especially important being the areas where the sections are butted together. Any vertical and horizontal adjustments necessary are made on the jackscrews while observing the targets through the alignment telescope.

Accurate alignment is made possible by the latter method. Vertical and horizontal displacement can be read in thousandths of an inch at 100 feet or more. This accuracy had never been attained by precision level and transit method used prior to the availability of these instruments.

**Squaring:** Another operation, made possible with this equipment, is setting columns or points at exact right angles or exactly perpendicular to any other member, *Fig.* 4. This procedure involves the use of the alignment telescope with autoreflection or, if greater accuracy is desired, autocollimation features. Optically flat mirrors are also needed for these processes. Optical squares, sometimes referred to as pentaprisms, are also used. The accuracy of these squares varies from absolute (90° 00′ 00″) to a few seconds, depending on price. One second arc in a triangle 100 feet long, subtends a leg of 0.0058 inch.

The setup illustrated in *Fig.* 4 employs an alignment telescope with a 45X magnification eyepiece, mounted on a special stand. With the use of an optical square, readings are taken with the aid of magnetic targets and mirrors. The diagram shows five positions for the targets which are placed where desired.

After leveling a large bed, a suggested procedure

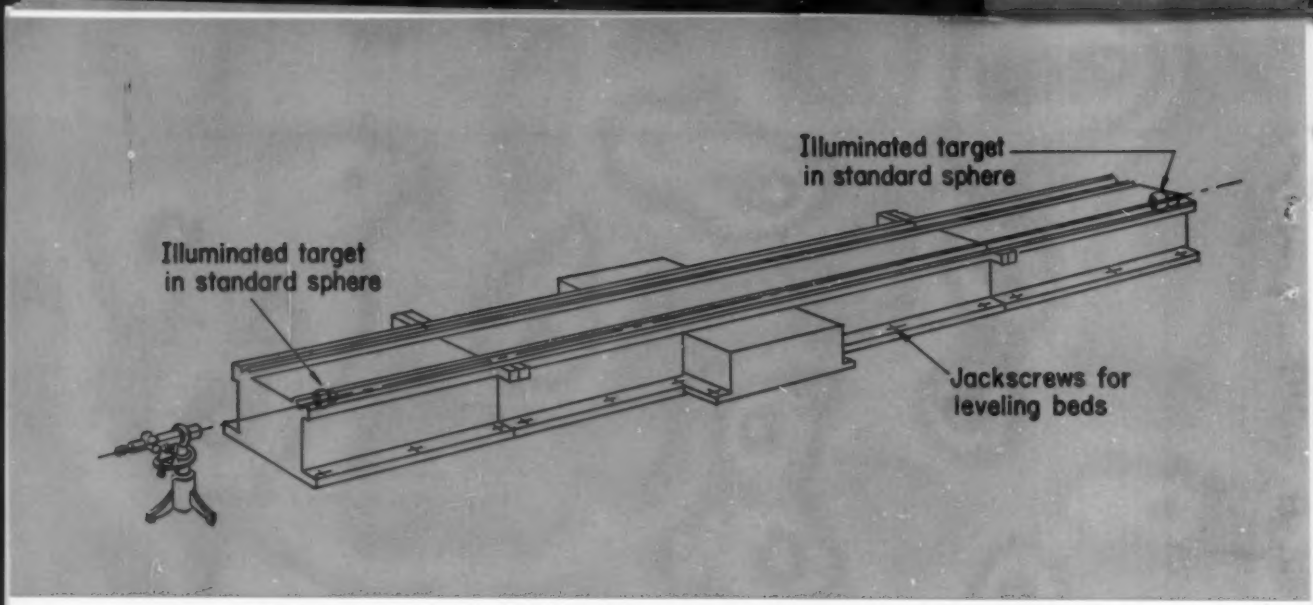



**Fig. 3. Preferred method of setting sectional beds for alignment. If levelness is necessary, a prismatic stride level can be mounted on the telescope or the bed may be leveled with a precision level and scale.**

for setting knees at right angles to it includes the following steps:

1. Place magnetic mirror on vertical member near base and approximately at midpoint of column or of the member.
2. Autoreflect alignment telescope to mirror for perpendicularity in horizontal plane.
3. Autoreflect optical square into the line of sight. Some method of lateral control of optical square must be used, otherwise position of generated vertical plane will wander.
4. Rotate optical square through 180 deg (or whatever is necessary) picking up magnetic targets any place on vertical beds. Any displacement of any point on the vertical plane from the original reference point picked up by the optical square may be read directly in thousandths on the optical micrometer of the alignment telescope.
5. Parallelism of T-slots in bed to vertical bed may be checked by placing a knee and mirror against a parallel bar set in the T-slots.
6. Vertical knees or planes may also be set or checked accurately with the use of the jig transit and optical micrometer.

**Setting Points:** The optical square, in conjunction with the alignment telescope, is used to set holes in tooling docks exactly opposite and at 90 deg. to each other. *Fig.* 5 illustrates an application for a tooling dock used for setting mock-ups. The two rails must be exactly level and parallel. The holes in one rail, spaced 5 inches apart, must be exactly opposite the corresponding holes in the other rail. Alignment of rails, and even individual hole alignment, is set or checked by the method of *Fig.* 5. Knees are checked for perpendicularity by autoreflection or autocollimation.

In using autoreflection or autocollimation principles with an alignment telescope and a mirror, the vertical travel on the head of a jig borer, planer, skin mill, etc., can be checked to insure exact perpendicularity to the working table surface of the machine.

**Other Applications:** Many other applications of this equipment can be found. These include the leveling of surface plates and tables with levels as well as the alignment of large turbine bearings with telescope and targets—which incidentally was the first application by the British in 1928 in the alignment of the propeller shaft and its bearings on a battleship.

Another facet of the increased use of optical tooling equipment is in the stress laboratory where specimens are tested for deflection, etc. An alignment telescope, with autoreflection or autocollimation features, and a special target mirror has been used to check angular deflection that is too small to be measured by any indicator available. By using this method, the magnitude of the applied loads can be greatly reduced, which means that simpler test rigs can be made.

Optical tooling equipment manufacturers such as Ferrand Optical Co., New York; Kueffel and Esser Co., New York; Taylor, Taylor and Hobson Ltd., Leicester, England, through their representative, Engis Equipment Co. of Chicago; and Henry Wild Surveying Instrument Co. of America, Port Washington, N. Y. can be of inestimable help in suggesting methods, techniques and setups. With the aid of optical tooling and the methods outlined, Gruman Aircraft Engineering Corp. has been setting heavy equipment with the ease, speed and accuracy required for aircraft manufacturers.

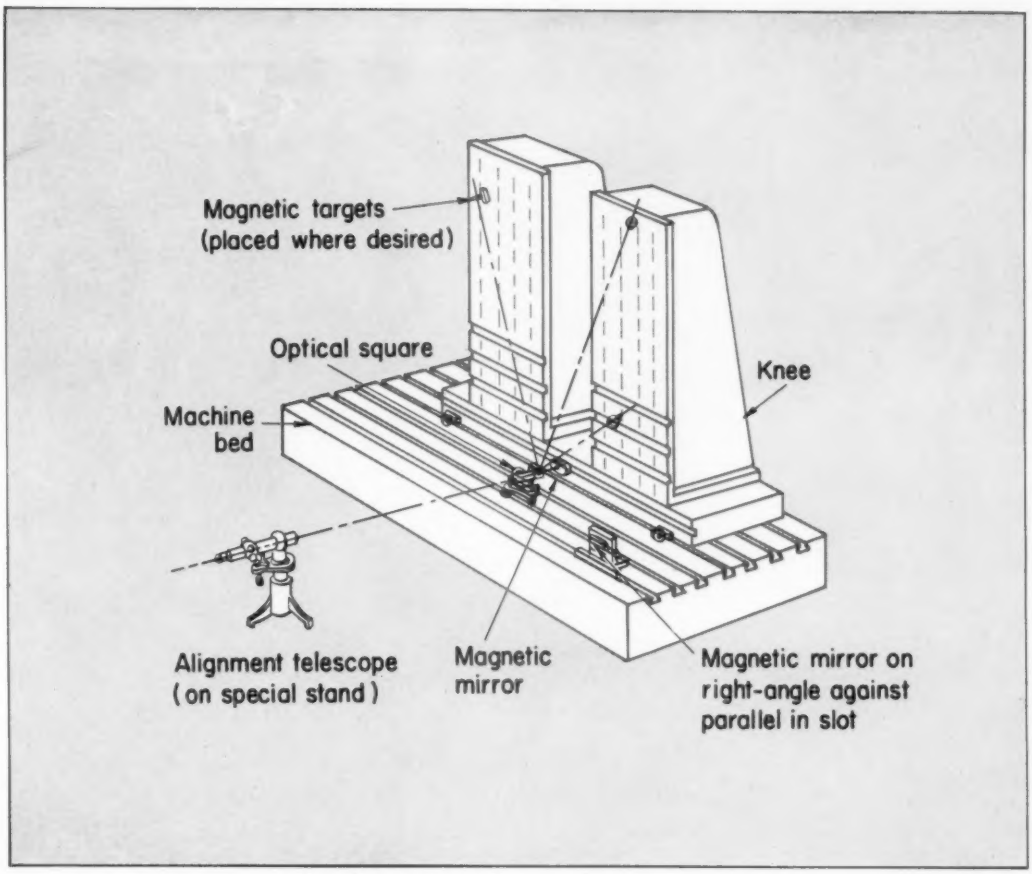
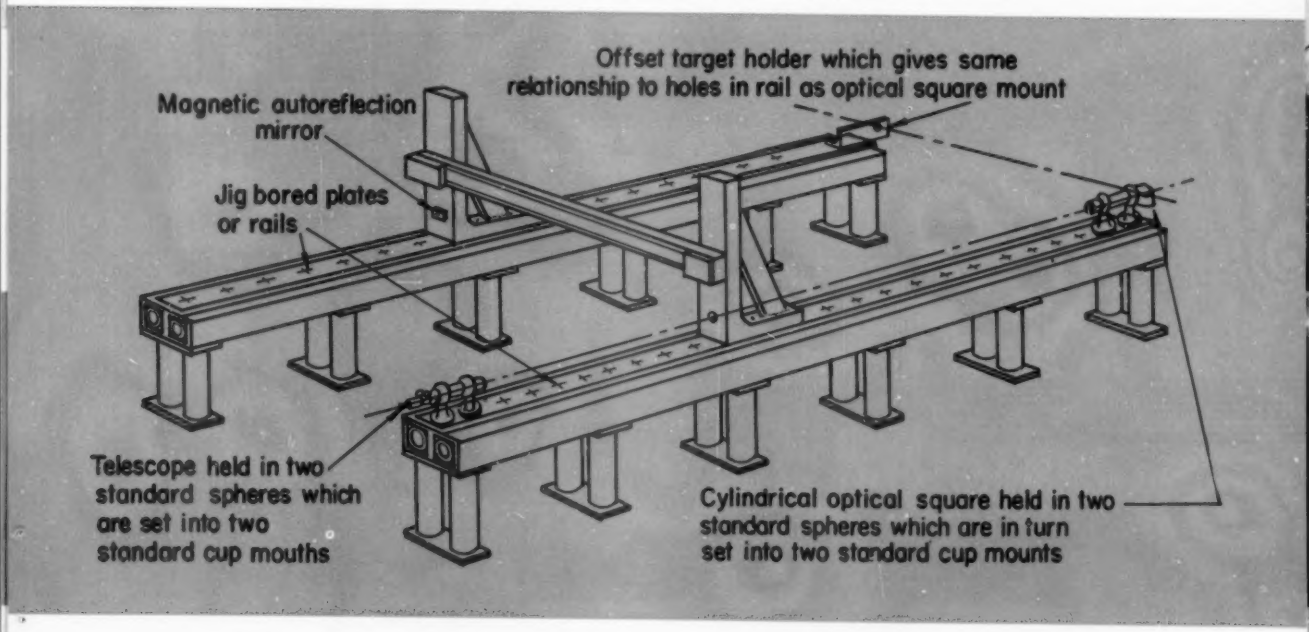
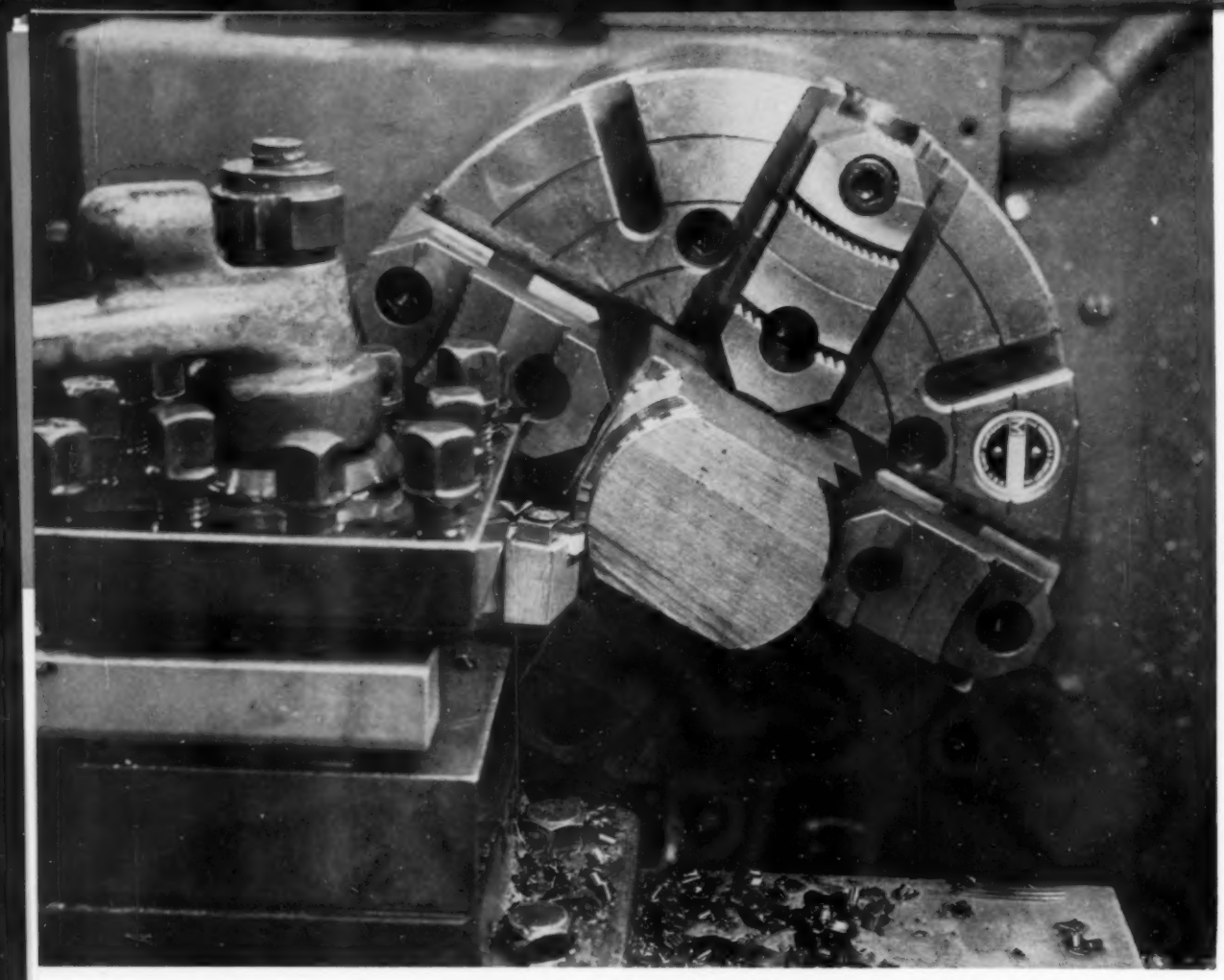



Fig. 4. Setting a large bed and squaring knees to it.

Fig. 5. Setting given points exactly opposite a point and perpendicular to a line.


Offset target holder which gives same
relationship to holes in rail as optical square mount
Magnetic autoreflection
mirror
Jig bored plates
or rails
Telescope held in two
standard spheres which
are set into two
standard cup mouths
Cylindrical optical square held in two
standard spheres which are in turn
set into two standard cup mounts



INTERRUPTED CUT with ceramic tool is performed on 4130 steel at The Glenn L. Martin Co., Baltimore. The cut was made at 226 sfpm with a feel of 0.10 inch and depth of cut of 0.125. The workpiece, originally $3\frac{3}{4}$ x $2\frac{5}{8}$ inch was turned to a round without breaking or dulling the tool. Ceramic material is Alsimag 614.

# TOOLS at work

DIEMAKING for small precision watch parts has been advanced by diamond research at Hamilton Watch Co. which resulted in this process. Die opening machine produces correct opening in diamond dies for drawing circular wire. A diamond powder abrasive on the thin vertical rod enlarges the hole in the diamond as the rod oscillates about pivot points at its lower end.

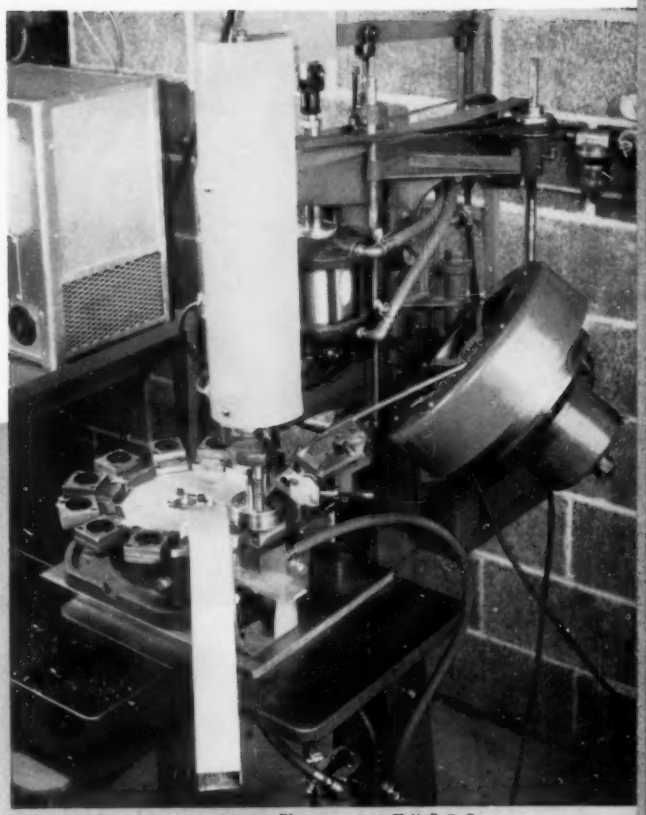
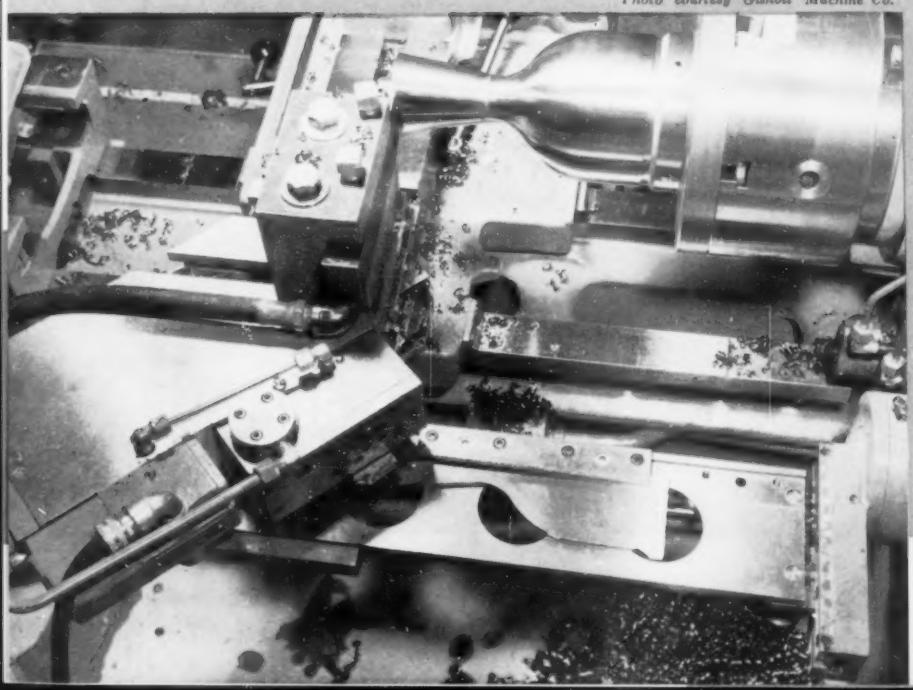


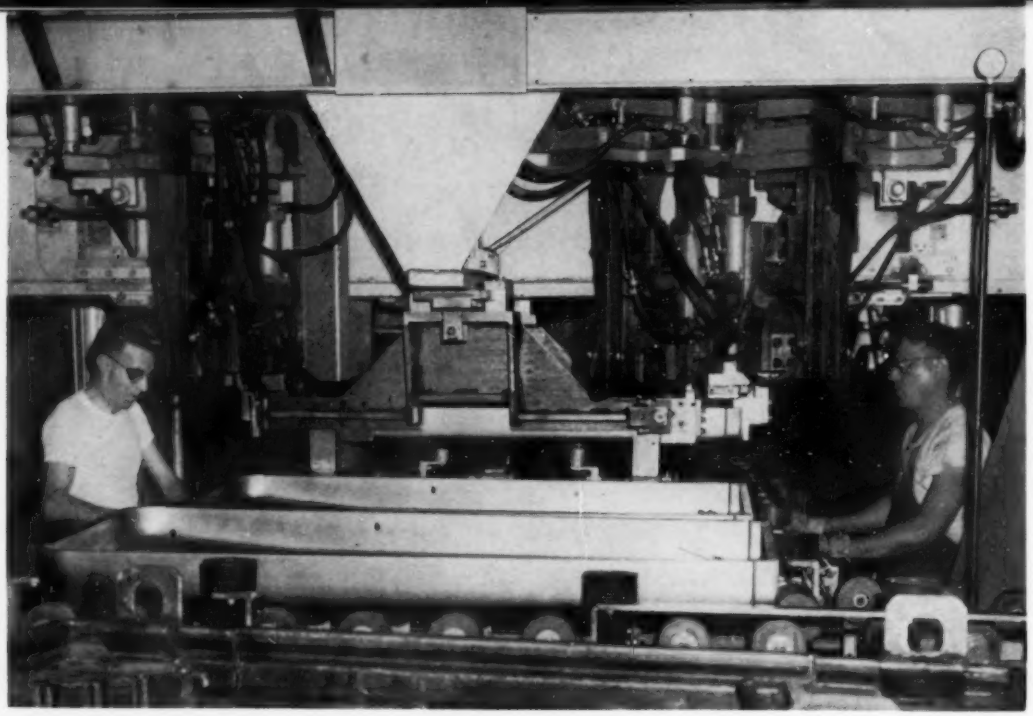
*Photo courtesy Heli-Coil Corp.*

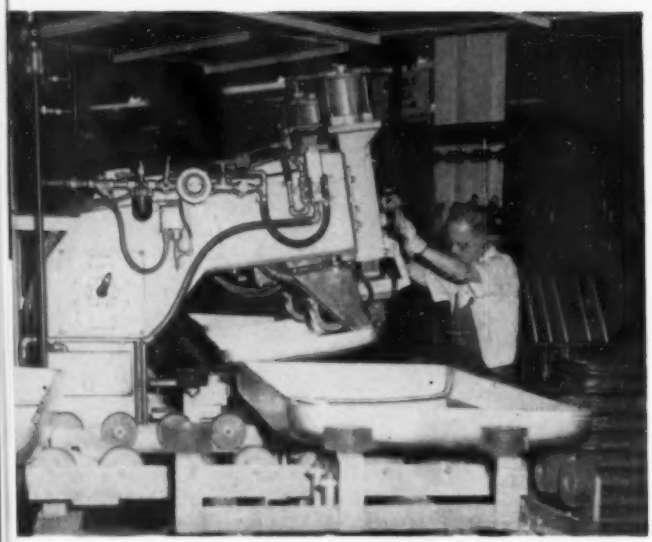
AUTOMATIC MACHINE installs wire-thread inserts of new helical design into straight sided holes of small parts in production operation. When the screw is turned into threads provided by the insert, the external threads are automatically anchored in the hole by a runout thread on the screw which wedges the top coil into the parent material.

*Photo courtesy Gisholt Machine Co.*



UNUSUAL MACHINING operation on forged steel nozzle employs hydraulic tracing and special draw-back fixture. Depth of cut for each of three successive passes is governed by standard graduated dial and handwheel on cross slide. Four screws clamp template (foreground) and two buttons with elliptical stems permit angular positioning of template. Average floor-to-floor time is 7.8 minutes.





*Photos courtesy Taylor-Winfield Corp.*

MECHANIZED ASSEMBLY of refrigerator doors achieves high production and continuous work flow in this projection welding installation. Automatic transfer is accomplished by roller conveyor system. The deep drawn outer shell travels first to a special dual head projection welder (top) where two hinge reinforcing brackets are joined to the door flange. A section of the rubber roll conveyor orients and positions the shell for the operation. To eject the assembly the roller table tilts, feeding the shell into the four-post welding press (below). Operators load the four corner gussets and position the door seal retainer. A cradle raises door into welding position. Conveyor then transfers door to succeeding operations.

## TOOLS at work

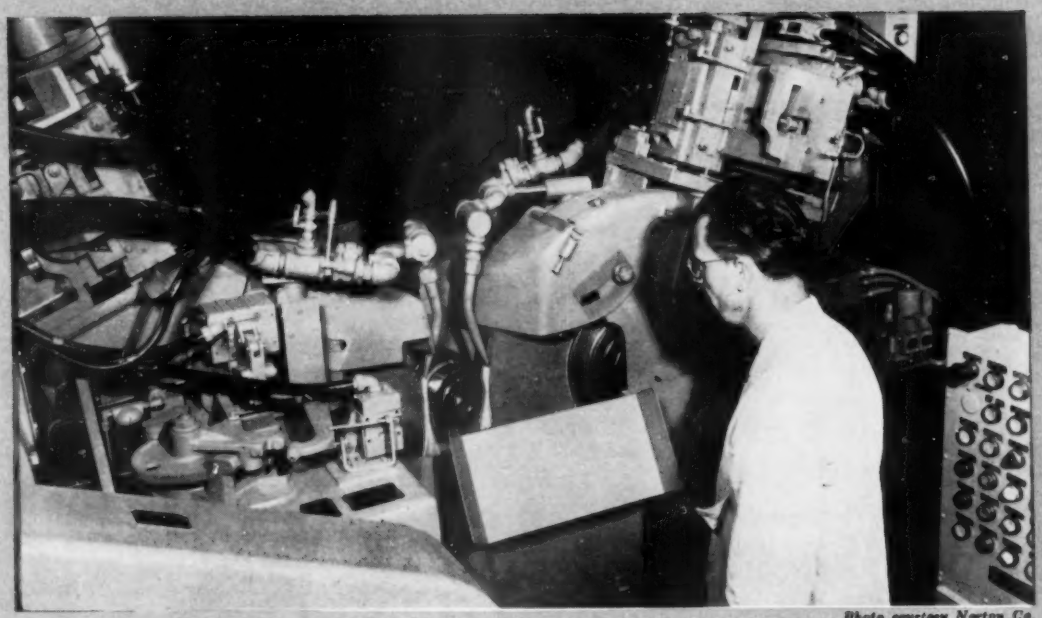
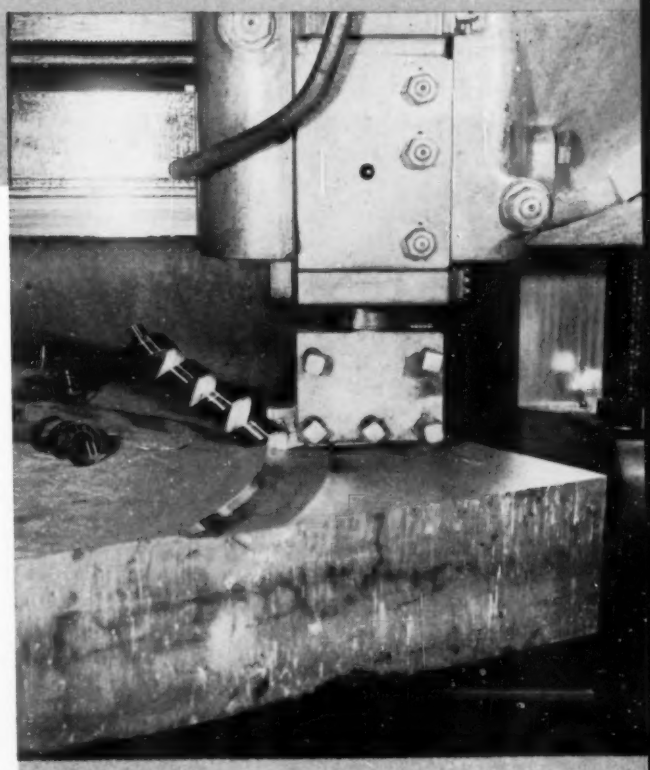


*Photo courtesy Norton Co.*

PLUNGE-GRINDING of multiple diameters on unusual workpiece simultaneously, is achieved on this special automatic machine. Central controls simplify supervision of the grinding cycle with its termination electrically timed. Automatic feed is adjusted with indexing mechanisms in increments of tenths.



NEED FOR MACHINING flame-cut plates in an emergency operation resulted in this set-up on a Cincinnati Hypro 50-hp boring mill, with insert Kennametal clamped tool. Long lead angle, combined with feed of 0.062 inch per revolution, produced a thin, wide, clean chip. The jump cut was made at 5/16 inch and 380 sfpm across corners of the workpiece. To machine the center portion of the bolster plate, a high-speed steel tool was used, as the surface speed dropped below that for efficient use of carbide.

# TOOLS at work

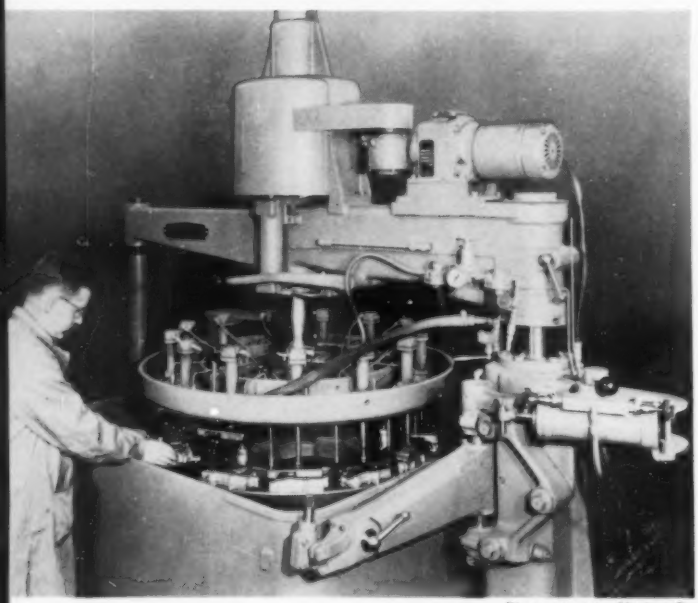
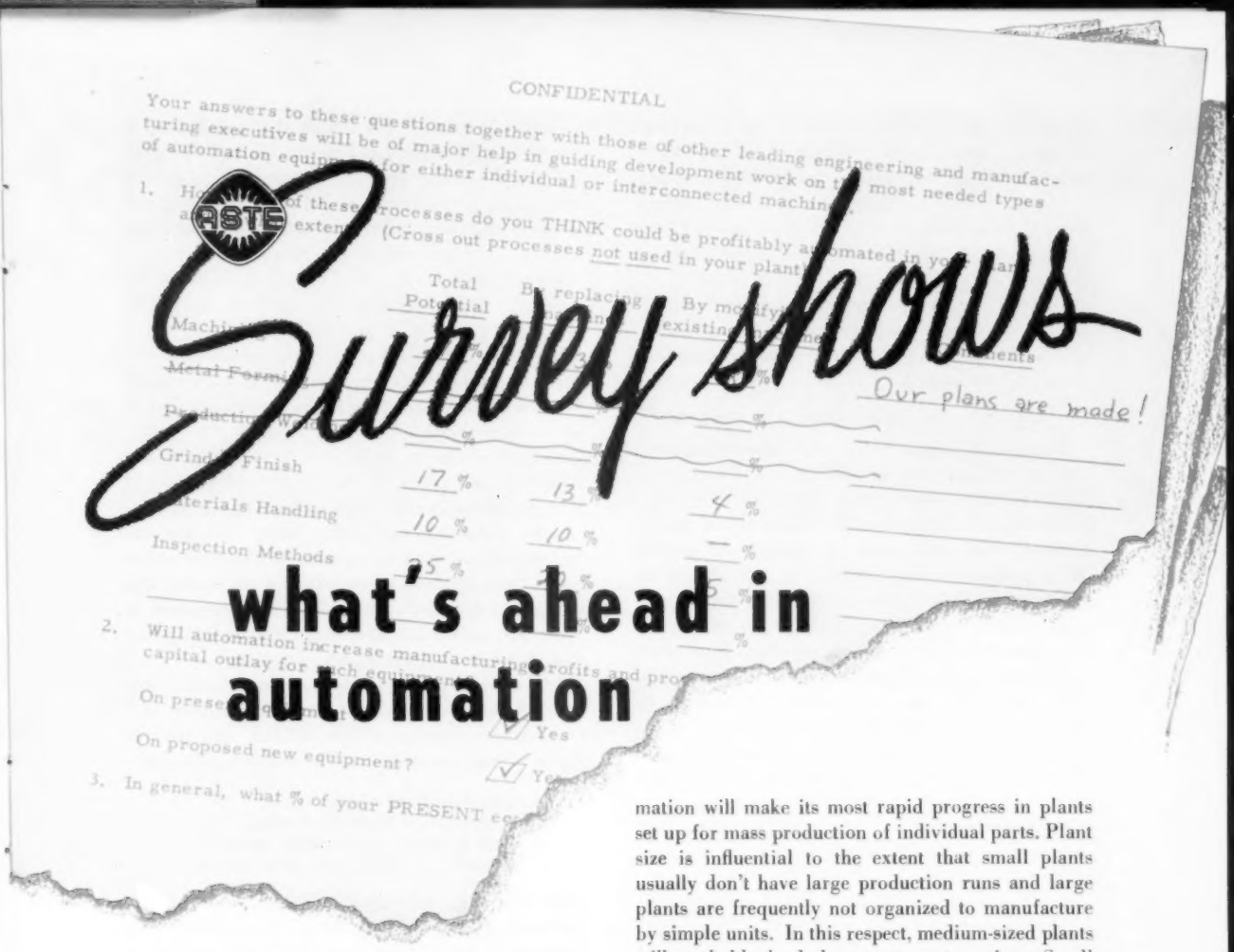


*Photo courtesy Norton Co.*

PRODUCTION LAPPING OPERATION uses timed cycle on automatic machine. The operator merely removes finished parts, inserts rough parts and presses button to start. Single flat face is being produced with a 48-inch bonded abrasive wheel lap. Workpieces are retained in adapters and lapping pressure is provided by holding devices. Lap face is generated and accuracy maintained by column-mounted truing arm, operated hydraulically.

(Below) PORTABLE TOOLING utilizes electromagnet to simplify an otherwise difficult operation of drilling and tapping upper die mounting holes in drop forge press. The 1-inch holes are produced by first positioning the unit to center-punch marks with reduced magnetic power. For the actual operation, a pulling force of 1900 lb is utilized, leaving operator's hands free for feeding the drill press.

*Photo courtesy Porta-Mag Inc.*




# Survey shows what's ahead in automation

**To determine the impact automation will have on production in the immediate future, the American Society of Tool Engineers has surveyed leading engineering and manufacturing executives. Answers have been limited to plans for 1956 and 1957. For this survey, "automation" means "automatic equipment used as a single machine or a series of interconnected machines."**

INDUSTRY TODAY FEELS that about 16 percent of all manufacturing operations in the metalworking industries can eventually be automated. While this percentage may seem small, it is actually large because conversion to automation will require replacement of much current equipment. This will require tremendous planning, financial and productive effort. In addition, it is estimated that 18 percent of all new production equipment orders to be placed in 1956 will call for automation. Conversion will accelerate, however, as indicated by combined new production equipment orders for 1956-57. Automation will be included in 22 percent of this equipment.

Since it is easier to automate production for a component part than for the whole product, automation will make its most rapid progress in plants set up for mass production of individual parts. Plant size is influential to the extent that small plants usually don't have large production runs and large plants are frequently not organized to manufacture by simple units. In this respect, medium-sized plants will probably lead the way to automation. Small plants will have to concentrate on production of a few items in large quantities and large plants will have to break production into smaller operations to achieve maximum potential benefits of automation.

The aircraft industry, contrary to what might be expected, is showing surprising interest in automation, particularly in engine and accessory plants. Over 20 percent of the industry's 1956-57 new equipment purchases will embrace some automation.

Although automation is applied to production, its influence on product design is increasing. Components will be more standardized in the future so they can be handled by existing automatic equipment. Design effort will not be stifled, however, because there will probably be greater flexibility in assembly. Automation in all phases of industry will be heightened if individual companies concentrate on standardizing components in their own products.

There is strong evidence that many companies will redesign their products with automation in mind. Products will be designed so that model variables can be handled in existing setups. A new concept of standards appears to be taking form. Rather than having fixed values, "standards," as applied to automated processes and equipment, would be a range

of values to permit reasonable future product changes without obsoleting production lines. Standards of the future will have versatility and flexibility.

As yet, there is no high expectation that automation can be applied profitably to job shops or job-lot runs. Industry would welcome new concepts of machine design or automation that would make possible automatic production of small lots. As automation is now progressing, production that entails an insufficient number of repetitive operations cannot be automated.

### Developments to Accelerate Automation

The biggest single factor that could accelerate broader adoption of automation would be availability of standardized production units that would not have to be scrapped every time a model change occured. Such units could be retooled and re-used for a period of years. Added to this should be greater versatility in control and operating equipment to handle wider ranges of sizes or more complex operations than are now possible. Such units would have to be designed to cover current speeds, feeds and loads, and have additional capacity to handle more rigorous operations in the future.

Versatility in control will probably come about through development of individual, automatic programming of production units by such means as tapes or punched cards. It will also be desirable if controls can be simplifled while allowing for production of small lots.

The necessarily high costs of automatic equipment are less of a deterrent to automation than might be expected. Lower costs would, however, greatly assist in speeding up the process of automation in broader segments of industry. As is true of tool engineers in any era, current tool engineers feel that available equipment will not do all the tasks they desire. They feel quality and reliability should be better and that further development is required. Such improvements as better methods of loading and unloading, automatic quality control with simple gaging and checking fixtures, and better procedures for controlling down time should be included in all future plans.

There is considerable feeling that automation of production processes has been proved and that automation of assembly operations represents the greater challenge. For reasons of potential economy and greater accuracy, more and more companies are beginning to investigate the possibilities of automatic assembly. Current thinking is aimed at developing automatic assembly facilities to handle small parts such as in printed circuitry.

Probable limits of production automation and methods of achieving this automation are summarized in the accompanying table. In the opinion of the metalworking industry, only about 5 to 10 percent of existing equipment can be adapted to automatic operation profitably. A large proportion of manufacturers feel they can amortize the high costs of new automatic equipment; fewer feel that the automating of existing equipment could be amortized. Such thinking is predicted on the feeling that equipment designed specifically with automation in mind will have a longer useful life than equipment that is adapted to automatic operation.

The marked preference for new equipment, translated in terms of specific classes of machines and automation potential, means industry will have to replace items now in use in the following numbers:

Over 200,000 machine tools
Over 55,000 grinders and finishers
Close to 50,000 metal forming machines
Approximately 25,000 production welders

These estimates are conservative and do not take into account the thousands of production units that will be adapted to various degrees of automatic operation. In addition, large numbers of related secondary production equipment will have to be upgraded to keep pace with automatic primary equipment.

It is evident that automation is here and that its adoption is picking up speed. Interest in automation is, as could be expected, high in the Middle Atlantic and East North Central states. That interest is equally high in the South may be surprising. As automation of production processes advances, automation of assembly operations will surely follow.

**Probable Limits of Manufacturing Operation Automation**
***(in percent of total operations)***

| Plant Size (employees) | Total Automated Operations | Machining | Metal Forming | Production Welding | Grinding & Finishing | Materials Handling | Inspection |
|---|---|---|---|---|---|---|---|
| All Industry | 16 | 23 | 20 | 15 | 15 | 23 | 17 |
| By new equipment* | — | 14 | 10 | 10 | 10 | 15 | 12 |
| 5000 or more | 14 | 20 | 15 | 15 | 17 | 25 | 15 |
| By new equipment* | — | 15 | 10 | 10 | 15 | 10 | 10 |
| 1000 - 4999 | 18 | 25 | 20 | 23 | 20 | 26 | 15 |
| By new equipment* | — | 15 | 10 | 15 | 15 | 21 | 10 |
| 250 - 999 | 17 | 28 | 26 | 14 | 23 | 30 | 24 |
| By new equipment* | — | 18 | 14 | 8 | 15 | 17 | 16 |
| Less than 250 | 13 | 15 | 10 | 6 | 10 | 13 | 10 |
| By new equipment* | — | 10 | 3 | 4 | 4 | 10 | 7 |

*Balance of automation to be achieved by modification of present equipment.

# applying cutting fluids

## *to best advantage*

**By M. C. Shaw and P. A. Smith***
**Mechanical Engineering Dept.**
**Massachusetts Institute of Technology**
**Cambridge, Mass.**

BECAUSE much heat is involved in high-speed machining operations and because tool life is usually strongly dependent on tool temperature, the cooling action of cutting fluids is important. Research work, sponsored by the ASTE Research Fund, is aimed at determining the relative efficiency of various methods of cutting fluid application. Results of this work to date are discussed in the following:

Mist lubrication in which small droplets of a liquid are distributed in a large volume of air (aerosol) has been used to lubricate high-speed ball bearings for about 25 years. More recently, a similar scheme involving a larger concentration of liquid and coarser particle size has been adopted in workshops to combine the attractive aspects of gas and liquid cutting fluids. The large surface to volume ration for each particle of liquid provides the possibility of rapid vaporization, which is an important step that must precede penetration at the chip-tool interface.

While the convective cooling capacity of an aerosol will be about the same as that for the gas, due to the small amount of liquid present, rapid vaporization makes it possible to have a large measure of evaporative cooling. For this purpose, a material of low boiling point and high latent heat of vaporization should give best results. Water is an ideal substance for this purpose, while oils are much less attractive.

Mist generators usually have filters for both air and liquid, a pressure regulator, a mixing valve, discharge nozzle and a reservoir for the fluid. Most units can be used with either cutting oils or water base fluids, but fluids containing solid additives in suspension are not recommended. Some manufacturers strongly recommend water base materials over oil base materials. The air pressure used with these devices ranges from about 10 to 80 psi.

Mist lubrication has been used on many machining operations. While the cost of the air used is significant, the liquid cutting fluid is conserved by this method. There is no drag-out problem on chips and the method may be used on operations where fluids are normally not employed, for example, on high-speed aluminum routing operation in the aircraft industry and on large planers. Air contamination can be a problem depending on the nature and amount of liquid employed. While there appears to be no tangible evidence that mist lubrication represents any health hazard, this problem has been raised. In this connection it would seem wise

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***Senior member ASTE Boston Chapter.**

**Abstracted from paper RR3, "Methods of Applying Cutting Fluids," to be presented at the 24th ASTE Annual Meeting. Copies of the complete paper will be available for purchase from Society Headquarters.**

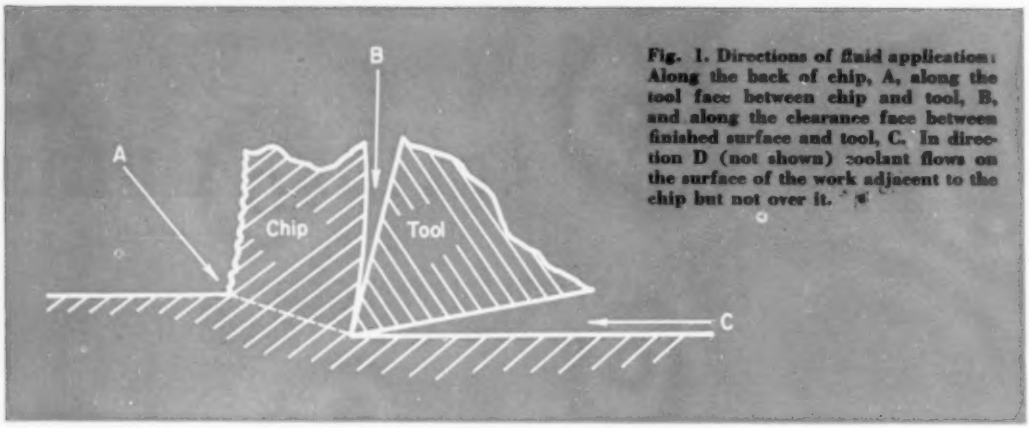



**Fig. 1. Directions of fluid application: Along the back of chip, A, along the tool face between chip and tool, B, and along the clearance face between finished surface and tool, C. In direction D (not shown) coolant flows on the surface of the work adjacent to the chip but not over it.**

to use as little liquid entrained in the air as is necessary and to install an automatic solenoid shut-off valve which closes whenever the machine is not in operation.

### Conditions of Test

To obtain a relative picture of performance of cutting fluids applied in the form of mist and flood under controlled conditions, a turning operation was studied, with cutting fluids applied in the directions shown in *Fig.* 1. Work material, somewhat more difficult to machine than average, was chosen in order that differences due to the cutting fluid might be more pronounced. Other tests had shown that these objectives could be met with annealed AISI 4340 steel, cut with a clamped carbide tool having eight cutting edges. Economic machining speed for this system, when a cut of moderate size (0.100-inch depth of cut and 0.010 ipr feed) is taken, was found to be about 500 fpm. This is faster than most tool engineers would have predicted for AISI 4340.

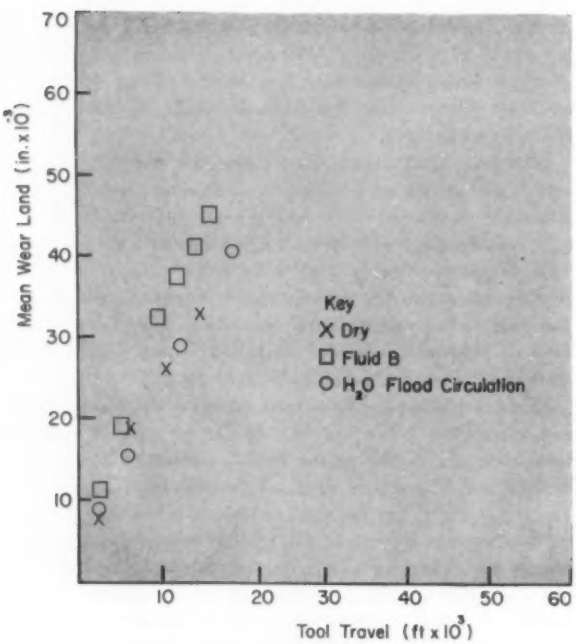



**Fig. 2. Comparison of tool wear characteristics of a dry tool and tools operating under a flood of water. Fluid B is applied from direction A. Cutting speed is 400 fpm.**

It was though advisable to make tests at 400 fpm, a practical shop speed for AISI 4340 steel. At this speed there is practically no built-up edge. It was felt that the tool-life study should also include tests where a built-up edge was present. When water is used as the cutting fluid, a built-up edge is found at speeds below 300 fpm for the tool-work combination used. Tool-life tests at 250 fpm were therefore included in the study.

Depth of cut for the tests was 0.100 inch and feed was 0.0104 ipr. Tool angles used were as follows:

| | |
|---|---|
| Back rake angle, deg | —7 |
| Side rake angle, deg | —7 |
| End relief angle, deg | 7 |
| Side relief angle, deg | 7 |
| End cutting edge angle, deg | 15 |
| Side cutting edge angle, deg | 15 |
| Nose radius, inch | 1/32 |

As a result of heat-to-heat variation in work material it was necessary to limit comparisons to tests within a single heat. In making these comparisons and in monitoring other tests, noncirculating tap water proved to be a convenient standard cutting fluid.

### Results of Tests

It became evident that there is little difference in the rate of tool wear for water and the two water

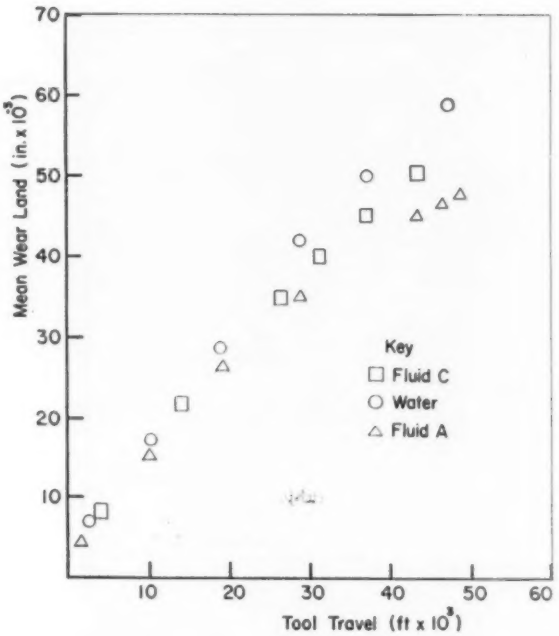



**Fig. 3. Comparison of tool wear characteristics of water and water base fluids applied as a flood from direction A. Cutting speed 400 fpm.**

base fluids tested for wear land values below 0.070 inch. These fluids will be identified by letter for purposes of this test. Fluid A is one of the more effective water base types available in recent years. Fluid B is a conventional oil in water emulsion using a petroleum sulfonate as emulsifying and rust-inhibiting agent. Fluid C is another popular water-base fluid developed since World War II.

There is a significant difference in total life values for these three fluids: 210 minutes for water, 255 minutes for Fluid B, 300 minutes for Fluid A. Other water base cutting fluids applied as a flood of liquid were found to give results at 250 fpm intermediate between Fluids B and A. Water base cutting fluids used in the investigation were used at concentrations recommended by their manufacturers, which generally correspond to 2.5 percent by volume (40:1).

While circulating water was found to be inferior to water base fluids applied as a flood of liquid at 250 fpm, this was not the case at 400 fpm. Plotted data in *Figs.* 2 and 3 show that there is little difference between a flood of water, a dry tool and water base cutting fluids at 400 fpm.

A number of tests using water base fluids in mist form are shown in *Fig.* 4 together with tests involving a flood of water and a dry tool for comparison. In all tests employing a mist, the amount of liquid was adjusted to 2 lb per hr unless otherwise stated. A pressure drop of 30 psi across a $\frac{7}{32}$-inch diameter nozzle was used. In tests involving a flood of liquid the rate of flow was adjusted to $1\frac{1}{2}$ gallons per min in all cases.

From these graphs it is evident that at 400 fpm there is negligible difference between dry tools, flood lubricated tools and tools lubricated with soluble oil mist. There is, however, a distinct improvement in tool life when water mist is used. The amount of water introduced as mist is seen to have a slight effect on the rate of wear, *Fig.* 4, but the higher concentration gives a greater total life than the weaker mist. Other tests with water confirm this result.

However, when the water base cutting fluids were used in mist form in these two concentrations no difference was found in either the rate of wear or the total tool life. Thus, in general the amount of liquid in the mist was not found to be critical, one quart per hour being adequate.

Tests at 250 fpm are shown in *Fig.* 5. By reference to the chart it is evident that water mist again gives a lower rate of wear than water applied in the form of a stream. While there is virtually no difference in the rate of wear obtained with Fluid B applied in the form of flood or mist, the total tool life for the mist is 28 percent greater than that for the stream of liquid.

The results presented in *Fig.* 6 show the effect of applying the cutting fluid from the different directions shown in *Fig.* 1. In *Fig.* 6a it is seen that directions A and C give similar rates of wear but that the total life for direction C is greater than that for direction A. Direction B is clearly inferior to those of A or C. In *Fig.* 6b direction C is again seen to give better results than direction A. In *Fig.* 6c little difference is seen when a stream of water is applied from direction A or D. Position D corresponds to a stream applied to the surface of the work adjacent to the chip but not flowing over the chip.

Distinctly poorer results were obtained for direction B, or when streams from directions A and B were used. From these tests it would appear that fluid applied along the tool face (direction B) has a negative effectiveness probably due to preventing air, which is an effective boundary lubricant, from penetrating the chip tool interface.

At low cutting speeds sufficient time undoubtedly exists for heat to be extracted from the back of the chip and the tool face temperature is thus reduced. At such speeds both tool and work would thus be cooled when the fluid is applied from direction A. At the high cutting speeds used in these tests there is probably insufficient time for heat to be extracted from the back of the chip while it is in contact with the tool and hence little cooling of the tool can be accomplished when fluid is applied from direction A. Only the workpiece is cooled in this case as in application from position D. When fluid is applied from direction C, however, it will cool both the tool

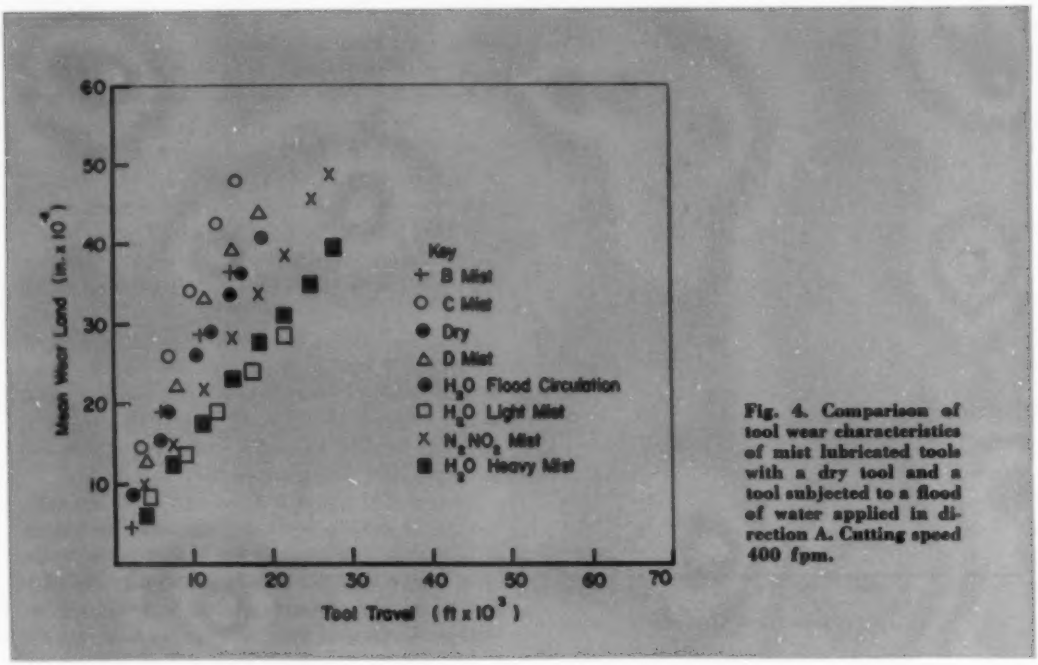



**Fig. 4. Comparison of tool wear characteristics of mist lubricated tools with a dry tool and a tool subjected to a flood of water applied in direction A. Cutting speed 400 fpm.**

and the work and a somewhat better result is to be expected. While both tool and work are also cooled when direction B is used, the exclusion of air from the chip-tool interface apparently makes this arrangement less attractive than direction C or A.

**Conclusions**

The tests that were performed with cutting fluids in the form of a flood of liquid and as a mist might be summarized as follows: The major role of the cutting fluid at speeds above 200 fpm is one of cooling. At 250 fpm water base fluids applied in liquid form are somewhat better than tap water due to a slight boundary lubrication action. At 400 fpm, however, the action is entirely one of cooling and liquid water is as good as any of the cutting fluids.

There is much more difference in tool life due to metallurgical differences in different heats of steel than due to differences in cutting fluids used in turning operations. The effect of speed upon surface finish is far greater than the effect of any of the water base fluids tested in the vicinity of 50 fpm. Both the flood and mist application of an effective cutting fluid are seen to decrease the amount of built-up edge obtained at low cutting speeds.

In general, water base fluids used in mist form give tool life results that are the same as those for the corresponding flood of liquid. Water is an important exception. Apparently there is a large measure of evaporation cooling when a water mist is used, which rapidly disappears when additions are made to the water. If a water mist cannot be used because of the problem of rusting, then a small amount of rust inhibitor such as sodium nitrite will give better results at high cutting speeds than an oily additive that interferes with heat transfer between tool, work chip and water droplets. Water is not a good material where finish is of interest, either when applied as a mist or as a flood of liquid.

The most effective direction in which to apply a fluid in the form of either a flood or mist is along the clearance face C, *Fig.* 1. In the case of fluids applied as a flood of liquid in high-speed turning this is inconvenient to the operator unless the machine is covered. Application of the fluid to the back of the chip A represents a compromise between performance and operator comfort. It is important that fluid not be directed along the tool face B since this gives distinctly poorer results in high-speed turning. It should be noted that use of mist makes it possible to apply the fluid along clearance surface C without bathing the operator. Use of a small tube attached to the bottom of the toolholder to direct mist along the clearance face is recommended.

While mist does not give as good a finish as a flood of liquid for the best fluids, the difference is far less than that for a good and a poor lubricant. Thus, where it is more convenient to use mist lubrication at low speeds, where surface finish is the major problem, little, if any, quality of surface finish is sacrificed.

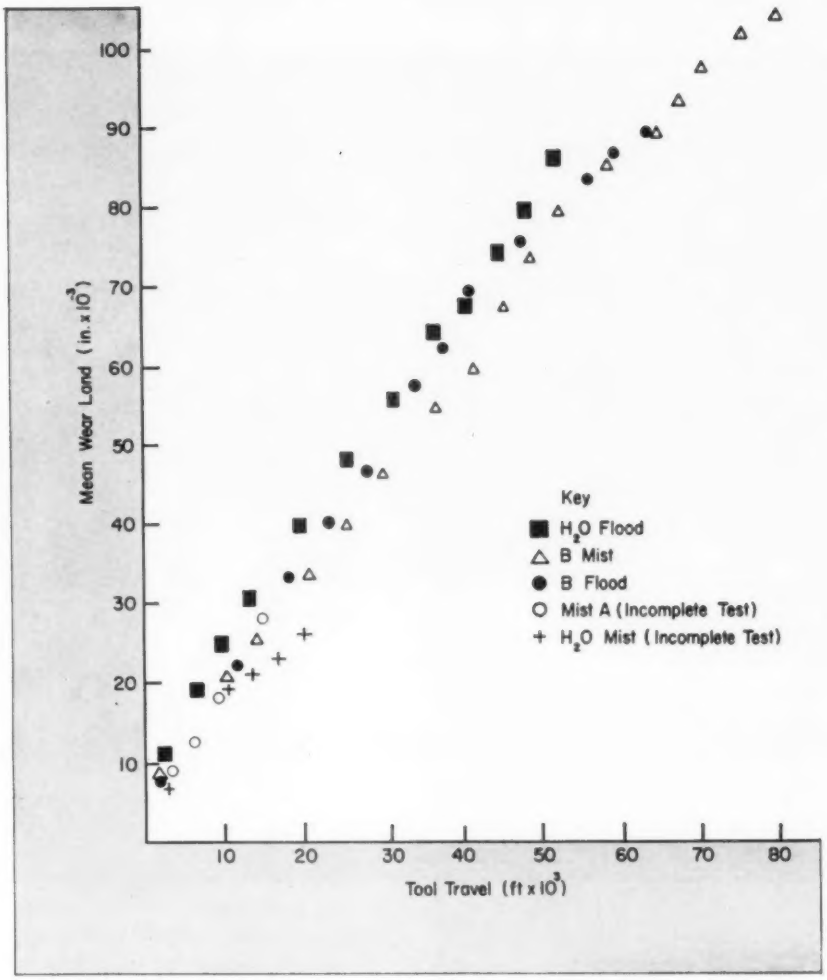
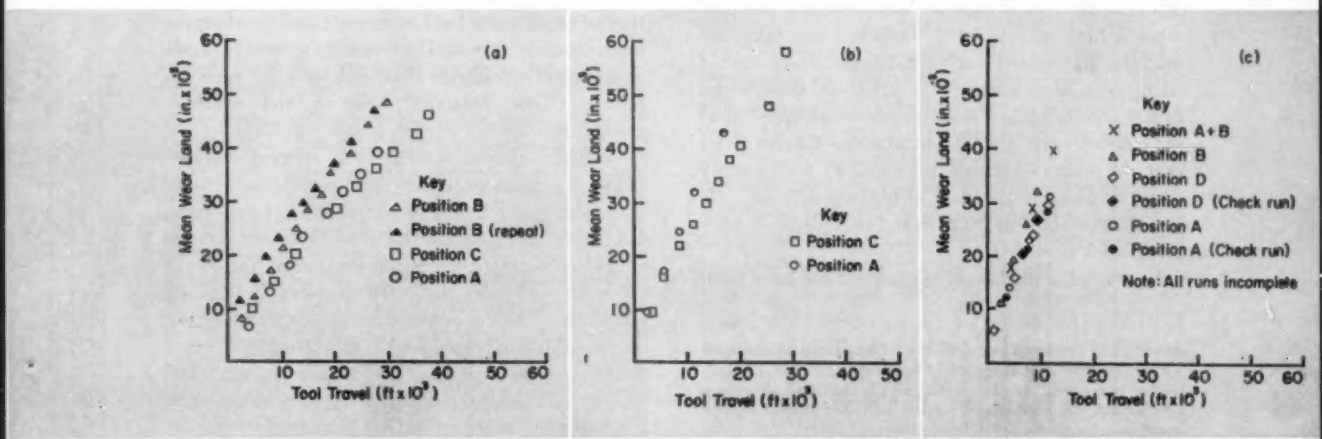



**Fig. 5. Comparison of tool wear characteristics of mist lubricated tools with tools subjected to flood lubrication from direction A. Cutting speed 250 fpm.**

**Fig. 6. Influence of direction of application of fluid on tool wear characteristics. Cutting speed 400 fpm. (a) Water mist, 16 lb per hr, from positions A, B and C. Solid points are repeat run from position B. (b) Fluid A mist, 16 lb per hr, from positions A and C. (c) Noncirculating flood of water from positions A, B, D and A plus B. Repeat runs are shown by solid points.**



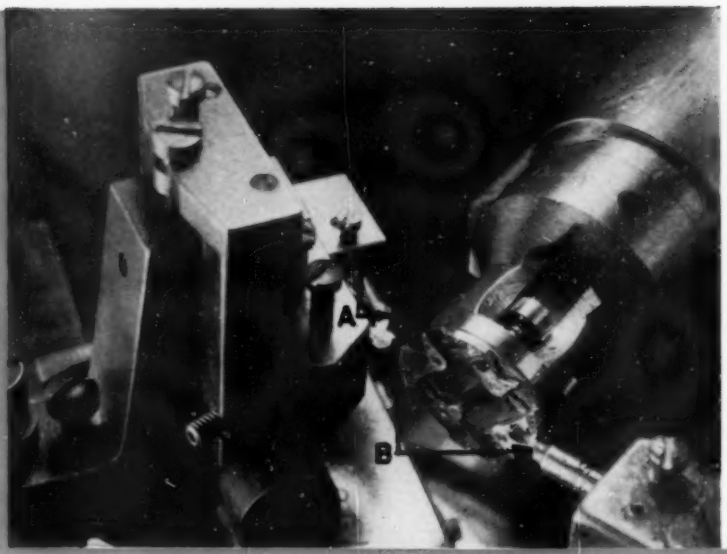



**Fig. 1. Four balance cocks can be beveled at once in a special holder. Two carbide tools, B, are used in addition to the diamond tool in this setup. One faces the outside diameter and the other roughs the bevel. Balance cocks are shown actual size.**

# diamond tools shape small parts

**By L. A. Hurwitz and R. A. Kurtz**

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DIAMOND TOOLS CAN BE economically justified when a high surface finish and close size tolerance must be maintained during the mass production of small, precision parts, *Fig.* 1. Even though the initial cost is higher than that for high-speed steel or sintered carbide tools, production figures show that the wear resistance of diamond tool cutting edges surpasses resistances of high-speed steel tools by a factor of 20 or 30 to 1 and carbide tools by a factor of 3 or 4 to 1.

In several applications, diamond tools have been in continuous use for a year or longer, finishing over 100,000 pieces before resharpening. Therefore, while the cost of diamond tools is high, the cost per part is lower than when steel or carbide tools are used.

While there are limiting factors, diamond tools have been found to be economical in the fabrication of small parts for instruments and timekeeping mechanisms. These parts must be precisely made and superbly finished. Diamond tools for such applications are critically designed and carefully used.

Rough diamonds are carefully selected for particular applications before being made into tools. Such selectivity increases the cost of the tool but ultimately pays for itself. The diamond crystal should be oriented to take advantage of the differences in properties that exist because of the face structure. Proper orientation avoids cleavage or octahedron planes parallel to the cutting surface of the tool. Also, it is desirable to orient the crystal so that a fine cutting edge can be maintained when the diamond is ground. The diamond should be

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**Abstracted from paper 24T21, "The Use of Diamond Tools for the Turning and Shaping of Small Parts," to be presented at the 24th ASTE Annual Meeting. Copies of the complete paper will be available for purchase from Society Headquarters.**

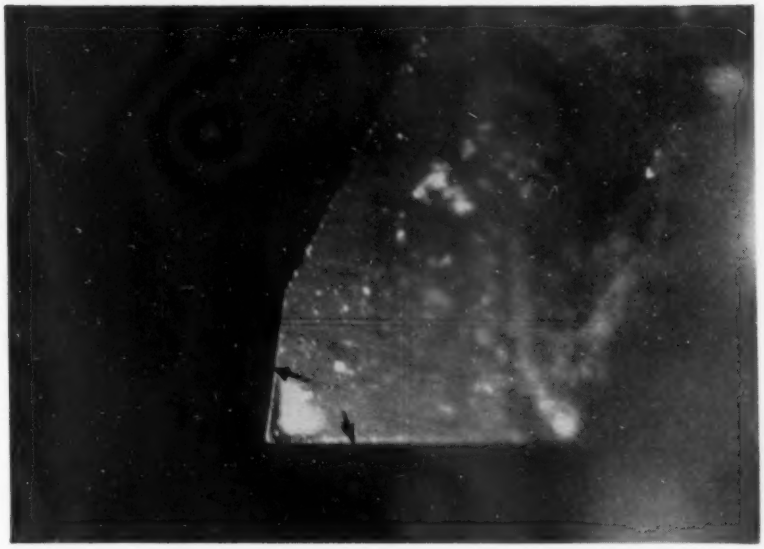
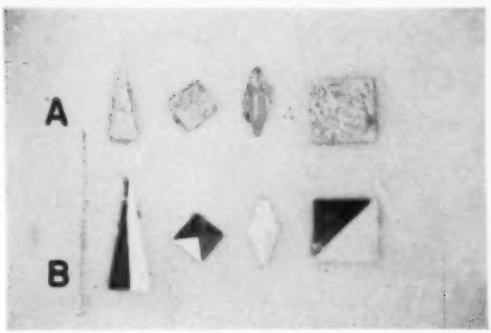


**Fig. 3. (left) Enlarged view of diamond pearling tool after cutting 130,000 pearling marks. Because of correct orientation of the diamond, cutting edges are intact. Chip wear has caused a cup on the face of the tool.**

**Fig. 4. (below) Diamond finished dial markers, B, are shown beneath rough blanks from which they are cut. Such markers range in size from 0.025 to 0.055 inch across the longest dimension.**

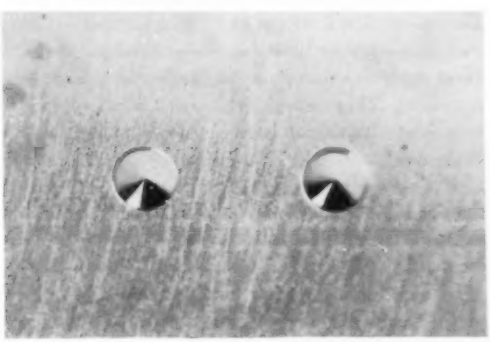



ground in a relatively soft direction and used in the opposite or relatively hard direction.

The last condition is important to full realization of the potential inherent in diamond tools. Tests conducted on diamonds used to burnish stainless steel parts show that production results vary in a ratio of 100 to 1 comparing the hardest direction of the hardest surface and the softest direction of the softest surface of the diamonds tested.

Good diamond tools that have been properly oriented and mounted can be ruined if used on improper equipment. Diamonds are brittle. Machines using diamond tools must be designed so that the fine edge of the diamond is not subjected to severe shock. The tool should be rigidly held and the machine should be free of vibration. In addition to the diamond and the machine, the operator must understand his tool and its limitations. Operators can make a diamond tool an economical production asset or a costly liability.

**Fig. 2. Pearling marks, 0.015 inch in diameter, are cleanly cut with a diamond tool that cuts with two faces simultaneously.**



Appearance of the face or dial of a watch is of prime importance since it usually leads to the first impression. Surface finish of the minute or hour markers is therefore, an important factor. These markers are usually small blind holes cut in the dial or small pieces of gold attached to the dial. In either instance, diamond tools offer an economical way of producing the required degree of finish.

As an example, two small diameter blind holes, *Fig.* 2, are used as minute markers on one silver dial. The bottom of the hole serves as a base for a cone, the point of which is level with the dial surface. Smoothness of the cut made by the diamond reflects light in a pleasing manner. One diamond tool, used to cut such pearling marks, rotates at 4,000 rpm and has formed over 130,000 marks before resharpening was necessary.

When this cutter, *Fig.* 3, was removed from the pearling machine, it was found that a small cup had formed on the front face of the diamond. This cup resulted from the flow of silver chips across the face. The cutting edge was still intact but had rounded slightly. Condition of this tool indicates

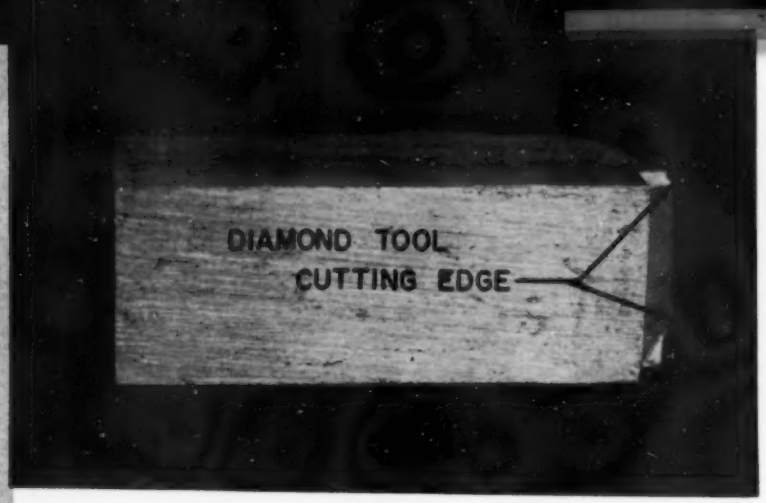
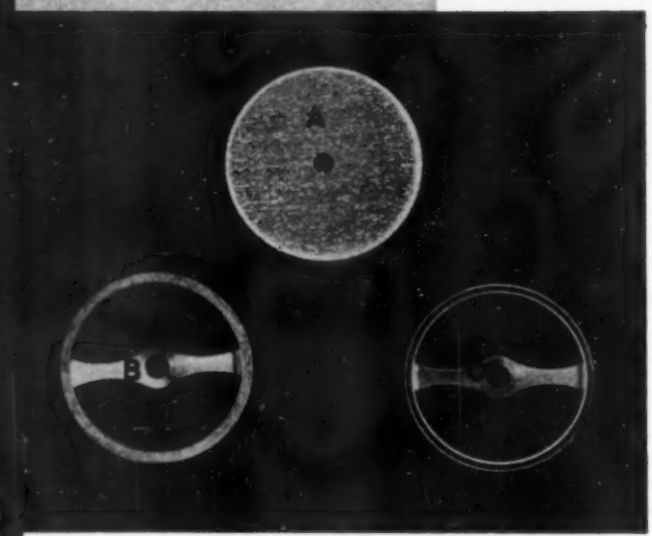



**Fig. 5.** (right) Diamond cutter used to plane the facets on gold dial markers. This cutter is mounted in a ¼-inch steel shank.

**Fig. 6.** (below) Beryllium-copper balance wheels in various stages of production.



presence of a relatively soft plane on the front of the cutter and a much more wear-resistant plane on the cutting edge.

Diamond cutters are also used to fabricate 18 Karat gold markers for watch faces. These markers, *Fig.* 4, are individually made and applied to the dial. When cut with diamond tools, these markers do not require secondary operations of polishing or buffing.

Rough dial markers are blanked from gold strip. They are then individually held in a machine while a diamond tool planes the flat facets. The marker is rotated so that all facets are planed with the diamond cutting in the same path. The time cycle for the machine to cut and index the four facets on a representative square marker is 11 seconds. Such a machine can cut from 1600 to 2000 markers per day.

Often, 10,000 or more markers are produced before the edge of the diamond, *Fig.* 5, must be resharpened. Because of the low coefficient of friction between gold or silver and diamond, diamond tools produce clean, highly polished cuts with no smearing. Steel or carbide tools cause smearing.

In addition to producing parts with highly polished surfaces, diamond tools are important in the production of small parts with close tolerances. Since the balance wheel is the governing part of a watch movement, it is made to precise dimensions with diamond tools. The center of a beryllium-copper balance wheel blank, *Fig.* 6, is punched out except for the center arm. A diamond tool is then used to face the arm.

Next, the balance wheel is shellacked on a quill for succeeding operations. The quill is placed on a machine and rotated at 1200 rpm while a diamond cutter feeds in and faces the side of the wheel. Two more diamond tools chamfer the inside and outside diameter of the wheel rim. After these operations, the wheel is removed from the quill and holes are drilled through the rim so that screws can be inserted to achieve correct balance. A diamond cutter is used to countersink the screw holes. Models of the diamond tools used for forming the balance wheel are shown in *Fig.* 7. Dimensional tolerances on the balance wheels are held to 0.0004 inch, and the inside and outside surfaces of the rim are concentric. Before conscious orientation of diamonds for cutters, production between polishes was about 5500 outside rim cuts. Since diamonds have been purposefully orientated, production has risen to an average of 7,591.

Screws to poise or balance the wheel are 8 or 14 carat gold, depending on the amount of weight that is desired. These screws are turned on an automatic screw machine. Completed screws are cut off with a high-speed steel tool. To finish the heads of these gold screws, they are individually chucked and a diamond tool is used for facing, *Fig.* 8. It is not unusual for one tool to face more than 100,000 screws between sharpenings.

Diamond tools are also used in several operations on the plates and bridges of a watch. These pieces

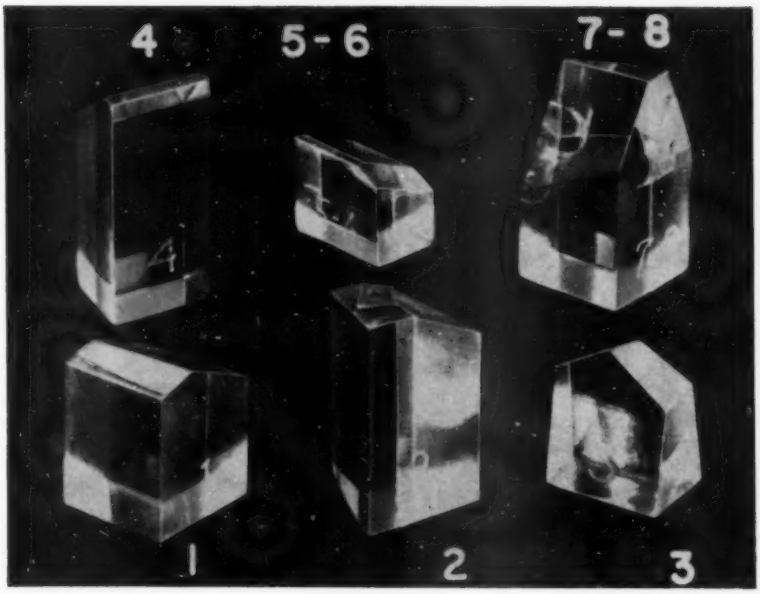



**Fig. 7.** (top) Plastic models of the diamond cutters used to form the balance wheel of Fig. 6.

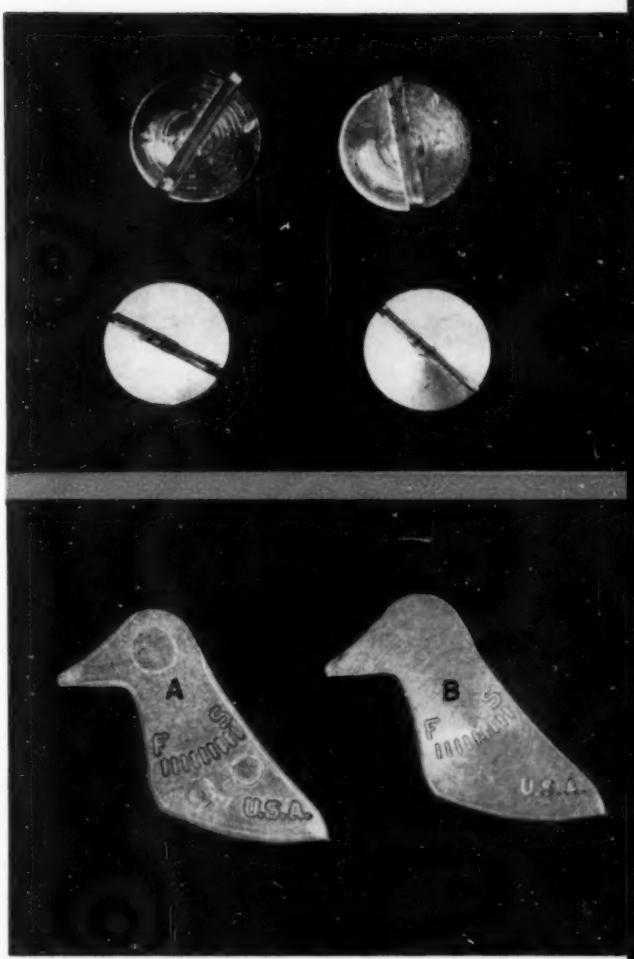
**Fig. 8.** (center) Gold screws before and after being faced with a diamond cutter. Rough screw heads result from the high-speed steel cut-off tool used on the screw machine.

**Fig. 9.** (bottom) The balance cock at left is shown after the scale and letters have been stamped. Greater sharpness is achieved by a facing cut with a diamond tool, as at right.

position the gear train and other working parts of the movement and are made of 12 percent nickel-silver. The small plate or balance cock used to support the balance wheel staff is shown in *Fig.* 9. The balance cock is stamped from strip and the letters and scales are stamped on its surface. A diamond tool faces the surface of the part. Letters and the scale stand out clearly because of the clean surface produced. Steel and carbide tools formerly used for this operation smeared the surface, leaving burrs and shavings in the recessed areas. Burrs not only spoil the appearance, but interfere with the rhodium plating process that is the next step. Beveled adges are formed on many of the plates and bridges with diamond tools for decorative effect and to make the movement thinner around the edges.

Several balance cocks can be machined at once in a holder such as that shown in *Fig.* 1. The holder is turned at about 1000 rpm and the diamond tool is fed in to produce the desired bevel. Carbide tools are used in the same setup. One is used to face the outside diameter of the balance cock and one is used as a lead cutter for the diamond finish cut. Appearance of the outside diameter is not critical so that carbides can be used for such cuts.

Diamond tools should be carefully considered when high surface finish and close tolerances are specified on small parts that are processed by turning or shaping. They are economical production tools because of their long service lives and because they frequently make additional operations unnecessary. Also, because of long service life, few tool changes are required during a production run.



# Economics

## of machine replacement

**By George Terborgh**
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**Machinery and Allied Products Institute**
**Washington, D. C.**

Traditional techniques used by American industry for analyzing the replaceability of equipment are extraordinarily primitive. Where they involve anything more than intuition or unaided judgment, they are simply rules of thumb. The most popular of these is the rule that new equipment must pay for itself within a stipulated period or must yield a specified rate of return.

This popular rule of thumb affords no practical guide to its own application. There is no theoretical limit to the shortness of the payoff period to be required or to the size of the rate of return. For example, if it is desirable to demand a 50 percent return before making a replacement, why not ask for 100 percent? If 100 percent is good, why is not 200 percent better? All that is required to get the 100 percent or the 200 percent, as the case may be, is to defer the replacement long enough and harvest the profits of procrastination.

The absurdities of this logic are obvious. Clearly, rule-of-thumb devices traditionally popular in American industry do not make sense. They are simply a piece of industrial folklore, handed down from one generation of managers to the next.

If these rule-of-thumb procedures merely yielded capricious results in individual cases, with no general or systematic bias, they could be regarded with a certain indulgence. It appears, however, with the exceptions to be expected of any generalization, that they operate in the main to delay replacement beyond the point indicated by more rational methods of analysis. In other words, their use results in an accumulation of mechanical zombies, to the detriment both of the enterprise concerned and of the economy at large.

Admittedly, there is no one best setup for administration of equipment policy. There are too many variables to reckon with: the size of the company, nature of the operation, character and condition of the facilities, the personalities in management and so on. But whatever the organizational chart, there are functional objectives to be achieved.

There should be continuous and systematic review of the equipment situation by an individual or staff specially trained in replacement analysis and primarily responsible for keeping the situation under surveillance. Re-equipment suggestions and proposals originating with operating executives should be analyzed and processed by such specialists, along with proposals they originate. In this work they should be assisted by whatever records it is practicable to keep on factors affecting replacement decisions. They should be responsible for the post-audit of earlier replacement decisions to detect any general or systematic bias in the expectations entering into the original analysis.

Finally, and most important, instead of dribbling re-equipment recommendations up to top management one at a time, as is so often done, they should supply a comprehensive picture of the equipment situation with a careful estimate of the expenditure required to make each indicated replacement, together with an estimate of the current annual cost of not making it. With such information before it, top management can draw up a re-equipment

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**Abstracted from paper 24T13, "The Economics of Machine Replacement," to be presented at the 24th ASTE Annual Meeting. Copies of the complete paper will be available for purchase from Society Headquarters.**

budget that means something; otherwise, it is shooting blind.

The revolution now occurring in the field of equipment policy shows a trend toward the substitution of replacement formulas for primitive rules of thumb formerly relied on.

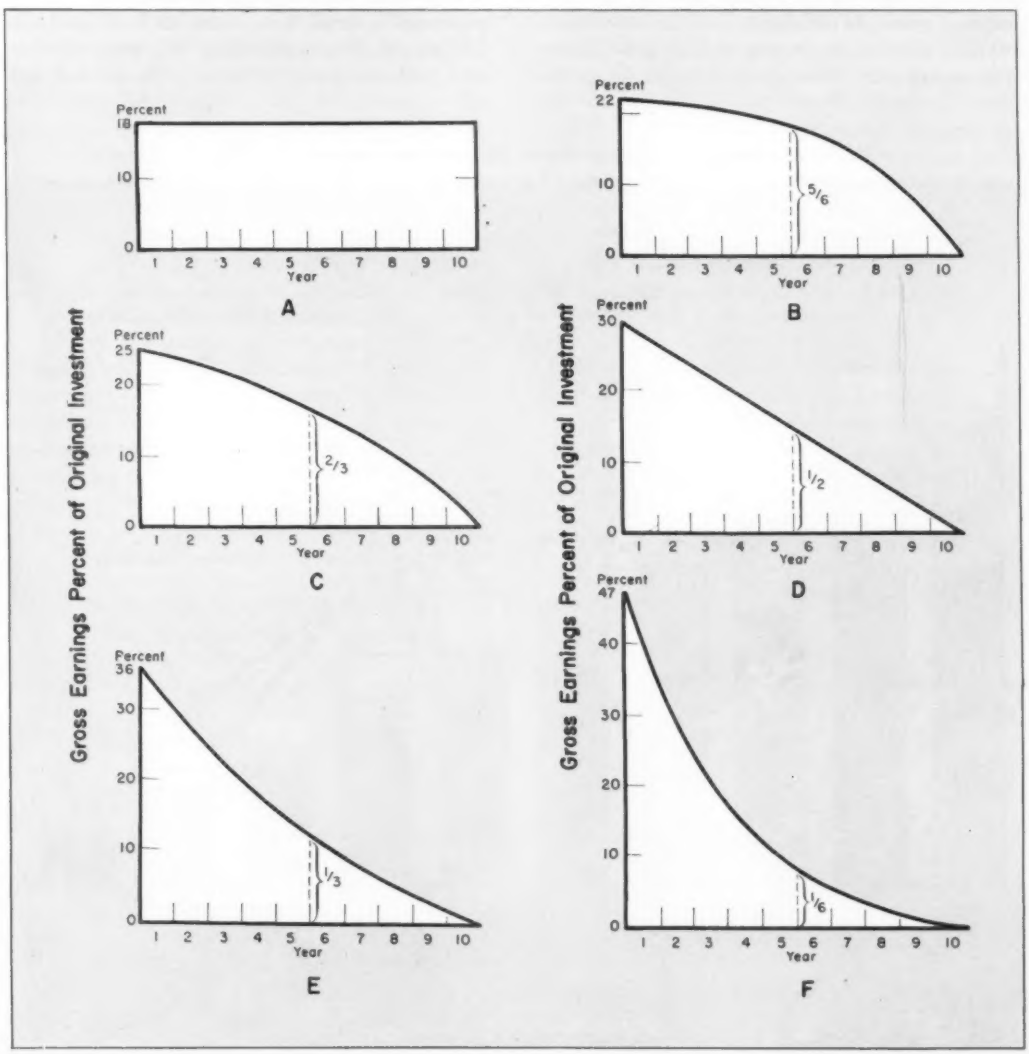
### Use of Replacement Formulas

A good replacement formula is a valuable tool of management if applied with understanding and discrimination. This qualification must be stressed for there is a widespread tendency once a formula is adopted to overwork it. It often is applied ritualistically, one might almost say superstitiously, to every problem that comes along, regardless of its suitability. A formula is not a piece of magic; neither is it a substitute for hard thinking and responsible judgment. It can be properly applied only by analysis fully aware of its built-in postulates and assumptions and fully able to appraise its appropriateness to the case in hand.

The function of a replacement formula is to make things simpler than they are. This simplification is not a defect; on the contrary, it is an inescapable necessity. The variables in most replacement analyses are too numerous, complex and unpredictable to permit a fully realistic solution. A formula supplies the simplication required to make the problem solvable.

Since the use of formulas is spreading rapidly,

**Fig. 1. Various time patterns showing gross earnings required to yield 10 percent on outstanding equity investment under the following conditions: service life, 10 years; terminal salvage, none; income tax rate, 50 percent; tax depreciation method, sum of digits; borrowed capital ratio, 30 percent; cost of borrowed capital, 3 percent.**



and since many companies are considering possible alternatives, it may be worthwhile to set forth the specifications a good formula should meet.

### Specifications of a Good Replacement Formula

**It Must Solve the Right Problem:** To begin with so obvious a requirement may seem trivial, but it is amazing how often even highbrow replacement formulas solve the wrong problem. Obviously, the right answer to the wrong problem may be quite as bad as the wrong answer to the right problem.

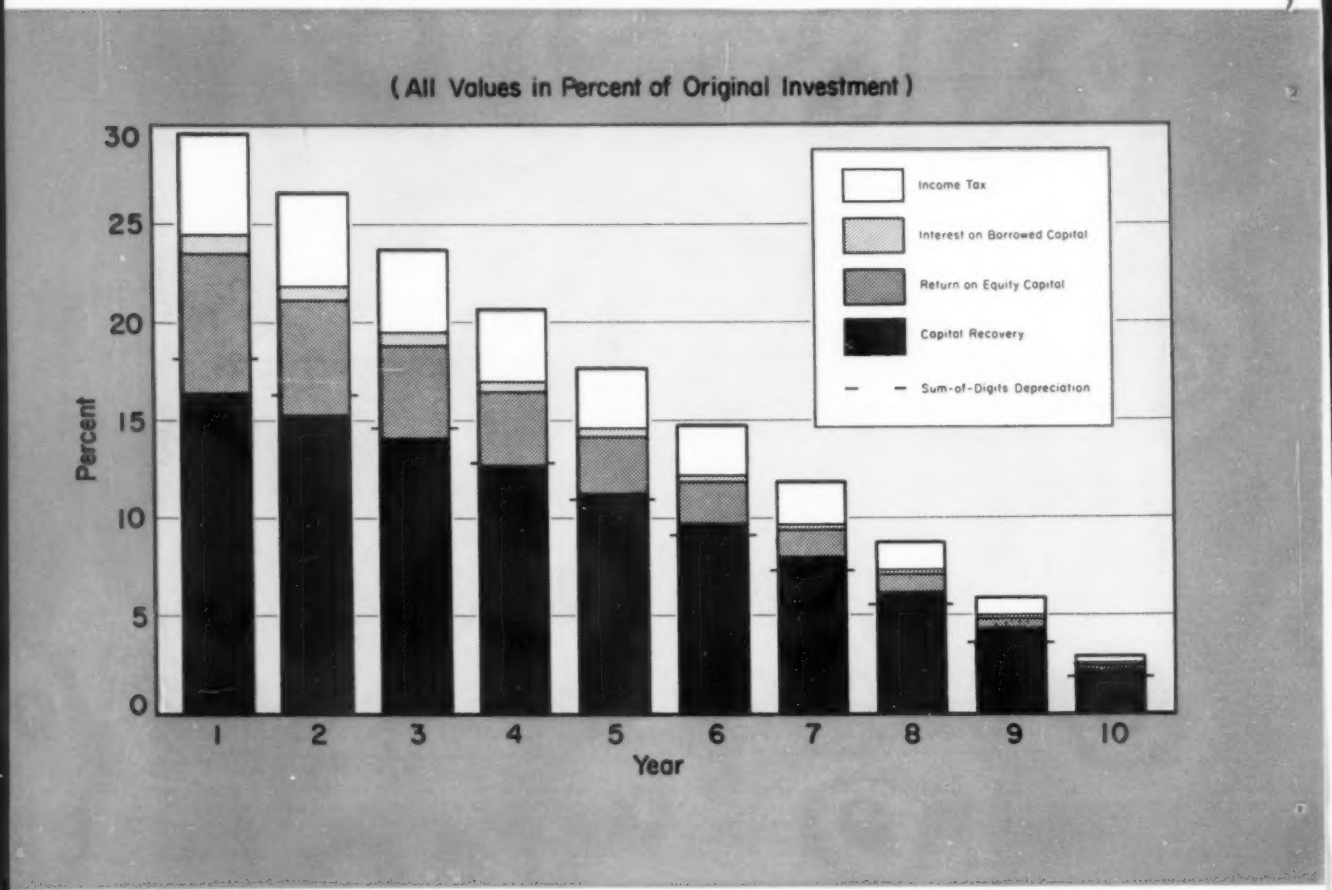
For instance, many formulas base the replacement analysis on a comparison of the performance of present and proposed machines over the estimated service life of the latter. Thus, if the new machine is given a life of 10 years, it is assumed that the old will be kept 10 years longer.

The difference between the performance of the new equipment over its lifetime and the performance that would be obtainable from the old, if continued in service over the same period, is ordinarily of no significance whatever. Even if the old unit is physically capable of service over the full life of the new—which it often is not—the real choice that confronts the analyst is between replacing it now or replacing it later. The choice, in other words, is between taking the presently available equipment for retaining the existing asset, not 10 years, but for some shorter period. The real question is whether there is any period of further service for which its retention is advantageous. This question cannot be answered by assuming that it must be kept 10 years or not at all.

Any formula, otherwise correct, that solves the problem in terms of this erroneous comparison will yield premature replacement signals. Its use will result in a wasteful application of capital funds and higher overall costs than are obtainable with a formula that solves the right problem.

**It Must Make Projections for All Relevant Variables:** Assuming that the function of a replacement formula is to make an insoluble problem solvable by simplification, this takes the form of a predetermination of some of the crucial vari-

Fig. 2. Breakdown of earnings shown for projection pattern D of Fig. 1.



ables required for a solution. The predetermination obviates the necessity for specific year-by-year predictions.

What are these variables? A few are: (1) the operating rate (2) duration of the operation (3) operating costs (4) service deterioration (5) obsolescence, the cost and performance of machines to be available later (6) salvage values (7) the cost of capital (8) the mix of debt and equity capital (9) income tax rates (10) tax depreciation methods. There are others.

Any good replacement formula must offer explicit projections for these variables. Only thus can the analyst know what he is assuming when he applies the formula. Only in this way is he in a position to appraise appropriateness of assumptions to the case in hand and to give proper weight to the results of the analysis.

**It Must Take Cognizance of Future Obsolescence:** Past obsolescence of an old machine can be measured by comparing its performance with that of its current alternative. It is impossible, however, to say just what the future obsolescence of that alternative will be. It is not specifically predictable. Nevertheless, few things are more certain than that it will accumulate obsolescence with time, and that this accumulation will impair its usefulness and figure among the reasons for its retirement.

No replacement formula can claim to be realistic if it fails to allow for future obsolescence. Yet this factor is usually ignored. This is true, for example, of the orthodox formula of engineering textbooks, minimum-average-cost. The effect of ignoring it, assuming the formula is otherwise correct, is to signal replacement too soon, resulting in waste of capital and higher total costs.

The importance of obsolescence as a factor in equipment replacement can be illustrated by a recent study of a small sample of analyses involving machine tools. The tentative conclusion emerged that on the average, something like 75 to 80 percent of the operating advantage of the new machine over the old represented the obsolescence of the latter rather than its physical deterioration. If the truth is anywhere near this, it emphasizes the importance of building into the replacement formula an allowance for the future obsolescence of new equipment.

**It Must Allow for Differences in Service Values:** Replacement analyses sometimes go wrong by reliance on the assumption that the service rendered by the old and new equipment is identical, hence that the only question at issue is the comparative cost of buying the new. Certainly this is true in many cases, but in others there are substantial differences in the value, as well as in the cost of the service. Dollar for dollar, one difference is as good as the other, a fact that should be recognized and allowed for in the replacement formula.

This allowance should not only take cognizance of existing service-value differential between the old and the new machines, but also of the possibility that future new machines may render an even more valuable service than the present one. In other words, the obsolescence allowance should cover service-value as well as cost obsolescence.

**It Must Handle Mixed Replacement-Expansion Situations:** This requirement is closely related to the preceding one. The service rendered by the proposed equipment may be superior to that of the old, not only in quality but also in quantity. In other words, it may provide additional capacity. If this extra capacity is currently usable, it should be taken into account as a credit to the new machine. Obviously, the replacement formula should provide a ready means for doing so.

**It Must Allow for the Cost of Capital:** Capital tied up in productive facilities is not a free good. If it is obtained by outside financing, it carries a charge in the form of interest or equity return. If it comes from funds already in possession, it carries an "opportunity cost;" it can earn a return in other applications. No comparison of alternatives involving different amounts of capital tie-up can possibly be correct without allowing for capital cost.

In making this allowance, the replacement formula must take into account the income tax cost of capital as well as its cost in interest and after-tax return. Since interest payments are deductible, while equity earnings are not, the tax cost varies with the "mix" of capital as between debt and equity. It varies also with the depreciation method allowed for tax purposes. It follows that a good replacement formula must allow both for the debt-equity ratio and for the depreciation method.

**It Must Allow for Present and Future Salvage Values:** This is an obvious point, but one often neglected. The present salvage value of the old equipment is usually taken into account, though not always correctly. It is rather uncommon, however, to recognize and allow for the future salvage value of new equipment. The omission may be of minor consequence in most cases, but it can be important. A good formula must accommodate this variable along with others.

**It Must Allow for Future Capital Additions:** This also is an obvious point often neglected. Some types of equipment require one or more major capital additions over their service life in the form of rebuilds, overhauls or heavy renewals. These should be projected and evaluated in the replacement analysis and the formula should provide for their inclusion. It should provide likewise, for any capital additions to keep equipment in service.

**It Must Yield the Cost of Not Replacing:** No replacement formula can be considered adequate unless it provides management with a reasonable estimate of what it is currently costing in dollars per year not to take advantage of available replacement opportunities. Such an estimate is essential in the intelligent administration of equipment policy.

**It Must Be Simple To Apply:** This point is absolutely basic. No matter how carefully contrived and "scientific" a replacement formula may be, it will fail of acceptance unless it is easy to apply. Few practicing analysts are willing to work through a half page of algebra to get the answer. It must be obtainable by, at most, a quick reference to simple charts or tables. No formula can be good in a practical sense without ease of application.

These, then, are 10 specifications for a good replacement formula. Present procedures should be tested against this standard.

### MAPI Development Project

The MAPI formula has now been in the field for 5 years. As a result of this experience, a good many things have been learned. A number of ideas have evolved, both for the development of the formula itself and for the improvement of its presentation. The major items are as follows:

**Semantics:** The original presentation of the formula introduced a number of unfamiliar concepts and some special terms coined for the purpose —challenger, defender, operating inferiority, inferiority gradient, adverse minimum, etc. These have proved a distinct handicap to its understanding and acceptance. A reformulation in more customary language is being worked on.

**Graphical Presentation:** The second item also has to do with the problem of presentation. Heretofore, only limited use has been made of graphical methods. A great deal more can be done with this approach and is being proposed.

**Choice of Projection Patterns:** At present there is available only one projection for the accumulation of deterioration and obsolescence on proposed equipment. This assumes a constant rate of accumulation. There is no reason, however, why other patterns cannot be provided, thus giving the analyst a range of choice. For example, the projected accumulation rate can be more rapid in the early years of service than later, or slower at first and then faster. With a choice of projection patterns, *Fig.* 1, the analyst can select the one that seems most appropriate for the proposed equipment and can achieve a better fit, *Fig.* 2, than when he has only one pattern for all cases.

**Precise Income Tax Adjustments:** The present formula allows for the income tax by an appropriate loading of the interest rate. The result is approximate rather than exact, with deviations depending on the method of service life being determined by the design life of that product. To such a case the regular MAPI formula is not properly applicable but experiments are under way with a variant that it is hoped will do the trick.

**Generalization of the Formula:** A final objective is the generalization of the MAPI system to cover new project investment as well as replacements and expansions within existing operations. The present formula was conceived and presented primarily as a device for analyzing the timing of equipment replacements. It is in this area that it has had its principal application. There is no reason, however, why the basic theory of the formula cannot be applied in the analysis of completely new projects, The reformulation now under way provides a useful guide for that purpose also. Incidentally, this reformation should facilitate the comparison of new-project and replacement proposals in the preparation of capital budgets.

With the modifications just outlined, it is believed the formula will meet completely the 10 specifications outlined earlier, to which the present formula conforms almost completely, exceptions being the approximative adjustments for the income tax and the debt-equity ratio. The time required for this project is well spent if it can make a further contribution to an informed and intelligent equipment policy for American industry.

## *Chemical Milling for Mass Production*

With the expanded use of the recently developed chemical milling technique, has come a production procedure developed by United States Chemical Milling Corp. to handle such work on a production scale.

Chemical milling, which can be done on any part that can be immersed in a liquid, was originally developed by North American Aviation for removing metal from airframes. The process removes metal by controlled etching in order to achieve minimum weight without sacrificing required strength. It is applicable to short runs as well as to production quantities, and even a single part can be processed economically. A prime advantage of its use is the diversified and complex configurations which can be chemically milled. Size of part is no limitation, and removal of metal on any surface or on more than one side simultaneously is practical.

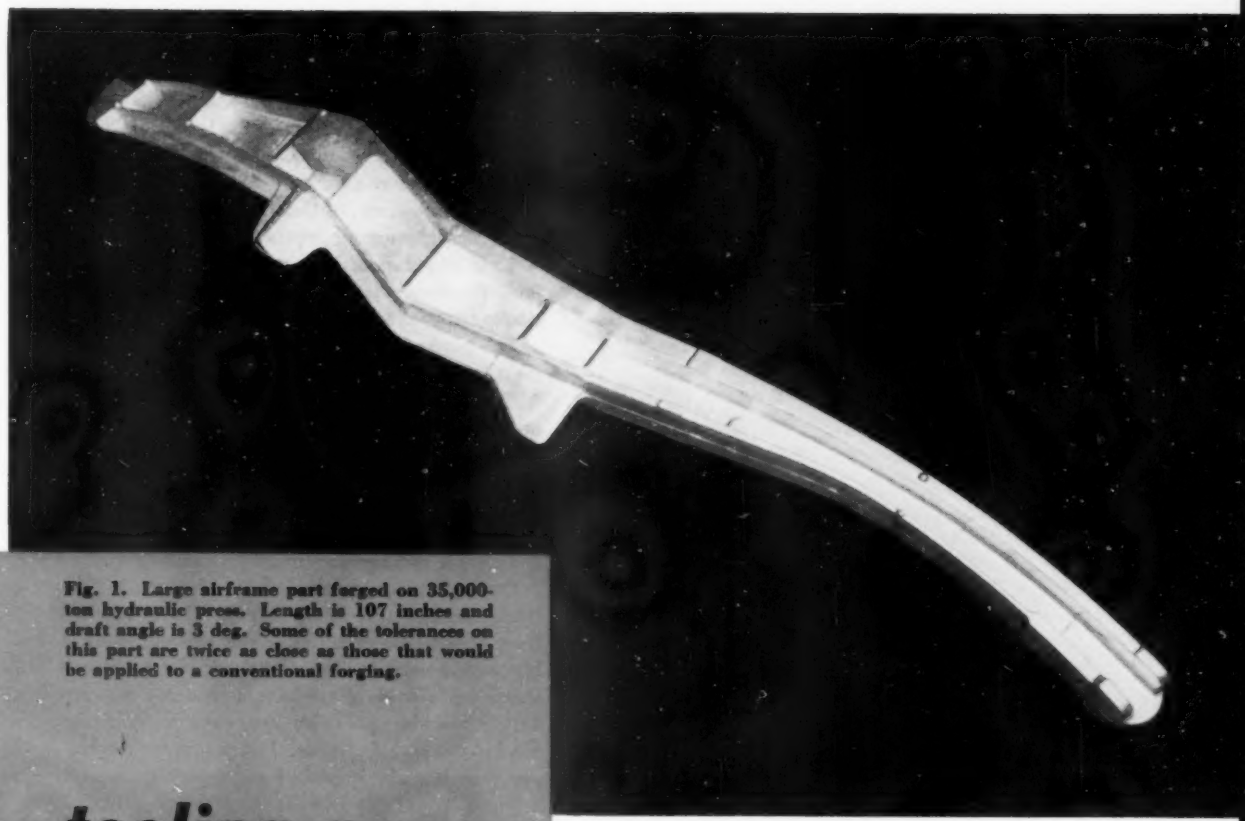


Fig. 1. Large airframe part forged on 35,000-ton hydraulic press. Length is 107 inches and draft angle is 3 deg. Some of the tolerances on this part are twice as close as those that would be applied to a conventional forging.

# *tooling a* HEAVY FORGING PRESS

**By Albert E. Favre**
**Chief Production Engineer**
**Forge Plant**
**Aluminum Company of America**
**Cleveland, Ohio**

SINCE THE CONCEPTION of the heavy press program, there has been a trend toward forgings having small fillet and corner radii, thin webs and ribs, low draft angles and close tolerance. While unit pressures for conventional forgings are about 10 to 20 tons per square inch, those for precision forgings are about 30 to 40 tons per square inch. Precision forgings require little or no machining except for drilling of holes and simple milling operations. Such forgings may or may not have draft. Achievement of greater precision has introduced problems in tooling but these are being solved, *Fig.* 1.

Need for large and precise forgings has stemmed

**Abstracted from paper 24T48, "Tooling Problems for Utilization of Large Hydraulic Presses," to be presented at the 24th ASTE Annual Meeting. Copies of the complete paper will be available for purchase from Society Headquarters.**

from the emergence of the jet engine as a practical aircraft power plant. The introduction of this new source of power brought a sudden increase in performance levels. Requirements for strength and rigidity in airframes increased enormously. Wings were swept back and thinned, complicating problems of attachment. At the same time, wing loads were increased. Large forgings of complex design were required to minimize the number of mechanical joints in the structure of the airframe.

Realizing that drop hammers would not be feasible for forging large parts, the Department of the Air Force sponsored the design and construction of large hydraulic presses. Such presses could handle die blocks weighing 15 tons or more. Since light alloys have good flow characteristics under sustained pressure, further advantages would be gained. High forging accuracy could be obtained. Also, it would be comparatively easy to maintain high die temperatures and provide means for part ejection in hydraulic presses.

Two of the heavy presses, one of 35,000-ton and the other of 50,000-ton capacity, were installed at Alcoa's Cleveland Forge Plant because of their previous experience with a 15,000-ton hydraulic press. These presses can contain dies approximately 23 feet long, 90 inches wide and with a thickness of from 14 to 40 inches. The entire die area will probably never be used, but a wide variety of sizes and shapes of forgings can be accommodated.

Large forgings resulted from changes in airframe design. Precision forgings have resulted from production problems associated with tooling for and finishing large forgings. High-strength aluminum alloy forgings have a tendency to warp during machining. There are ways to minimize this but the problem exists. Equipment for machining large forgings is limited and expensive.

Die costs for precision forgings are two to five times higher than those for conventional dies and costs per forging are many times higher. Because conventional forgings have to be machined on all surfaces, over-all savings are possible, especially for long runs, and output per unit of time can be

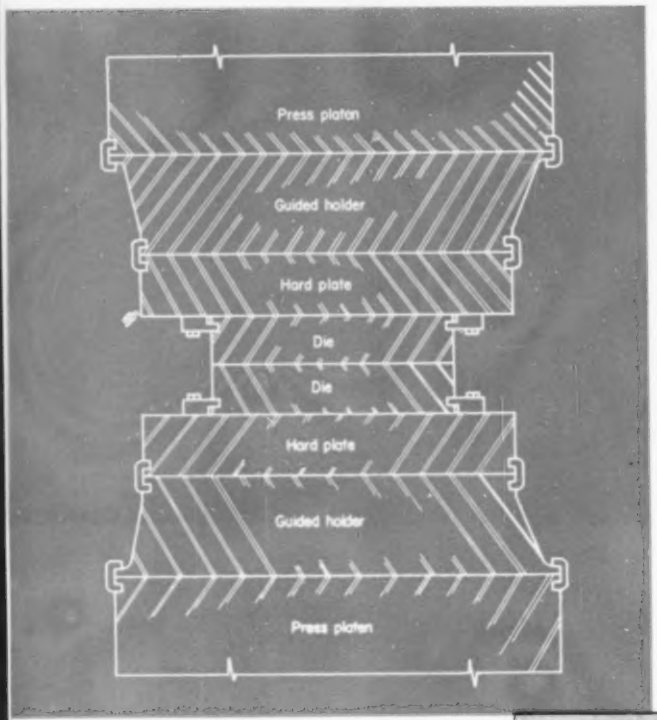



**Fig. 2. (above) Cross section of die and holder arrangement for heavy press. Load on the die area is distributed and pyramids to the platen area.**

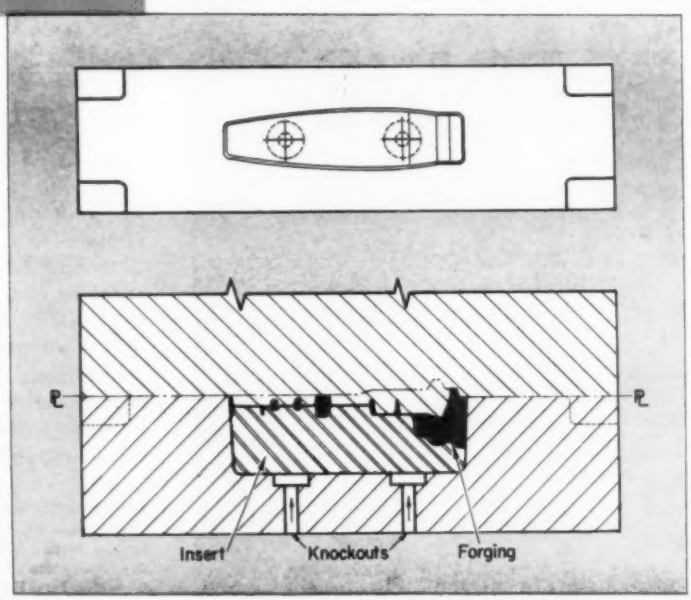



**Fig. 3. (right) Frequently, a complete segment must be used as a knockout for forgings with little or no draft. This minimizes distortion during ejection.**

increased with precision forgings.

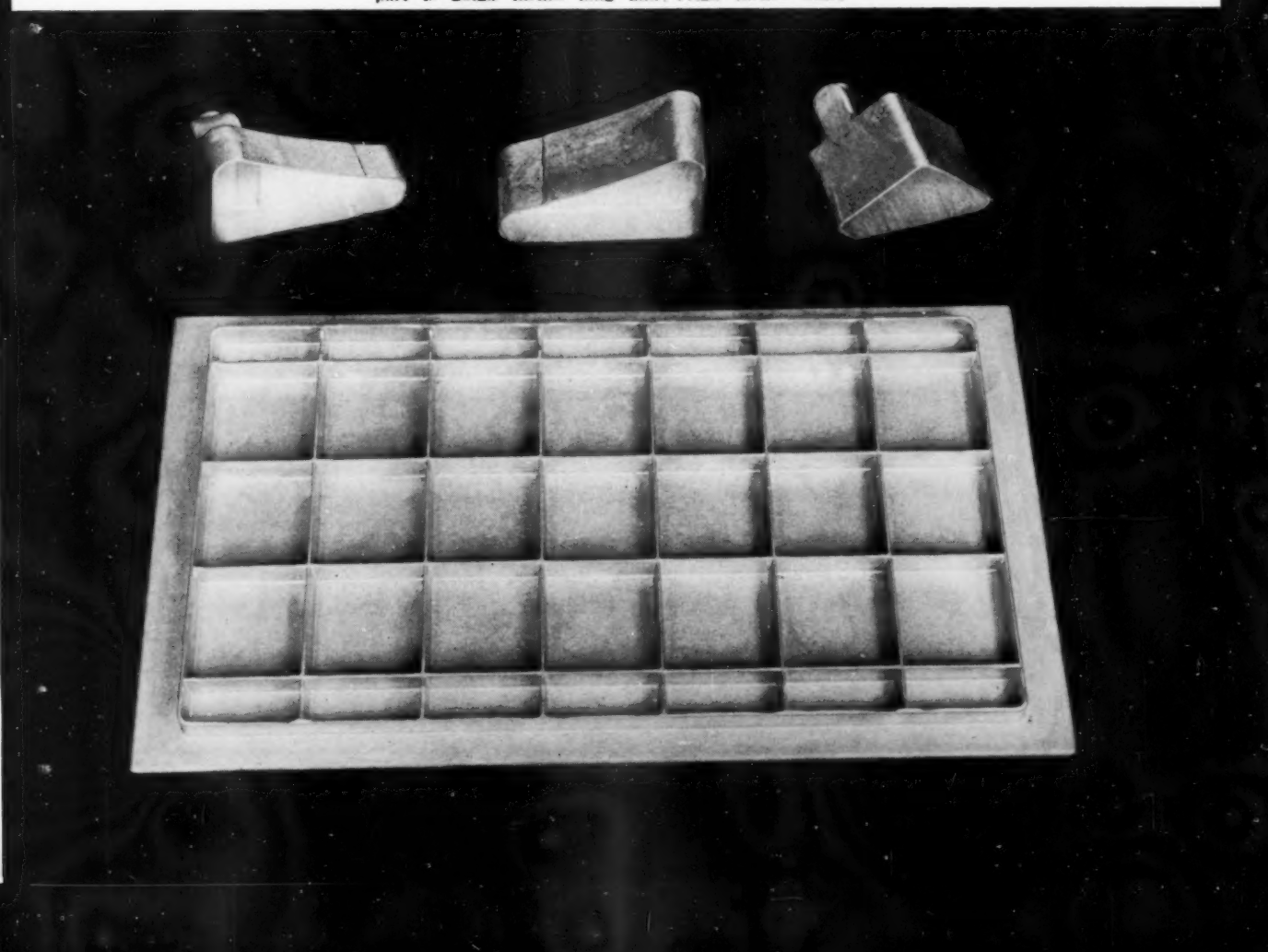
Lead time for precision forgings is much greater. More engineering is required because tool and assembly drawings must be prepared in addition to the drawings normally required for conventional forgings. Die construction takes longer because, to meet closer tolerances, inserted or segmented dies are required.

Some of the production problems have been anticipated and solved during design of the presses. They are rigid and designed to withstand off-center loading; airframe parts are generally nonsymmetrical. Because many precision forgings have little or no draft, knockout provisions have been made in both top and bottom platens. Forgings can be ejected with a minimum of distortion. Holders and dies have been designed, *Fig.* 2, so that deflections during forging can be minimized. With this arrangement, a minimum die size is established for use of full load. Load is distributed, because holders, plates and platens are flat and parallel, and the bearing area on the platen is greater than the die area.

The conventional method of making an impression in a solid piece of steel with ordinary cutters is impossible for precision forgings where ribs are deep and narrow, and have little or no draft. Precision forging die inserts or segments are hardened, and ground to a high degree of accuracy and smooth finish. The segments are assembled and held tightly together in a yoke or holder. Butting surfaces of inserts and yokes must be held to close tolerance to prevent leakage when full pressure is applied. The use of conventional knockouts may be impractical because of the configuration of the part and it may be necessary to use the entire insert as a knockout. *Fig.* 3. Fit must be accurate to prevent slivers of metal from lodging between the die surface of the holder and the segment that is used as a knockout.

To fabricate forgings accurately, stock and die temperatures should be accurately controlled during all phases of the production run. Attempts to obtain close die closure tolerances, as well as length and width tolerances, have proved that the more nearly equal the die and stock temperatures the closer the tolerances. Adequate lubrication represents a problem when operating with dies at approximately 800 F. Also, shrinkage that occurs in the forging during heat treating and aging must

**Fig. 4. Examples of parts made without drafts. Largest part is 20.25 inches long and 11.25 inches wide.**



be predetermined and allowed for in the die.

Mismatch can only be controlled by keeping the press rigid, and guiding the holder and die as they come together. Counterlocks or guide pins are used the dies to minimize mismatch. Temperature control must be accurate if minimum clearance is to be allowed for such pins and counterlocks.

Because the draft of a conventional forging acts as a lead into a straightening die, conventional forgings can be straightened rather easily after heat treating. Since precision forgings include little or no draft, they are difficult to straighten in this manner. Close straightness tolerances are obtained by use of twisting mechanisms and fixtures that rigidly hold parts during heat treating and quenching.

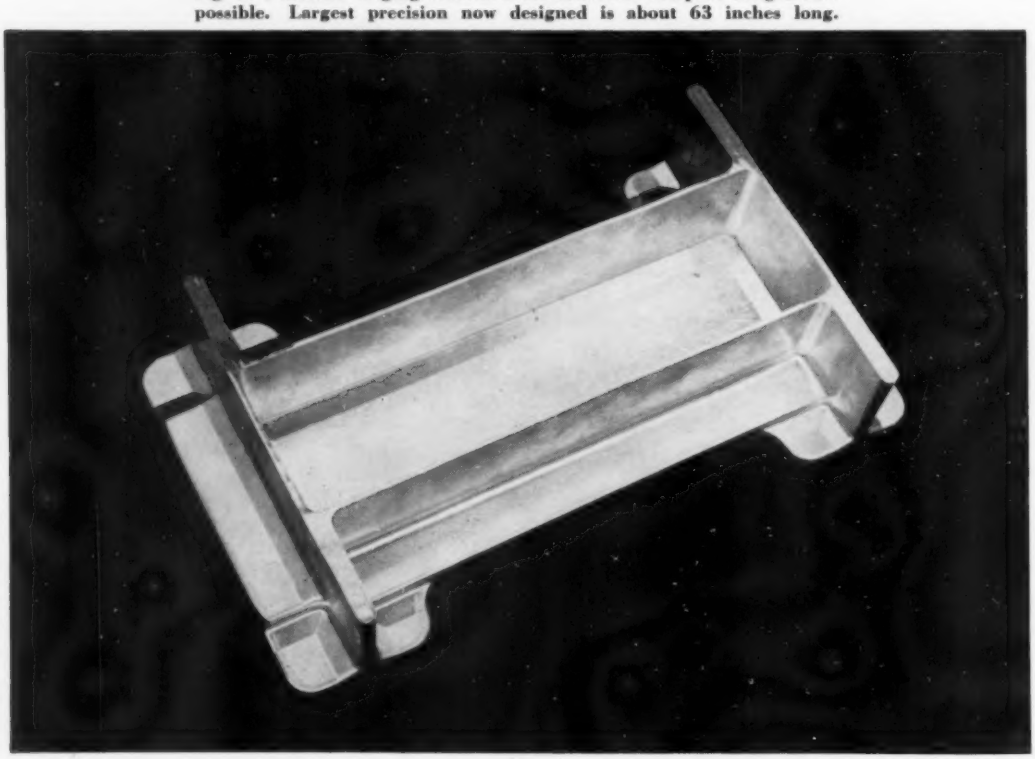
It is possible to correct out-of-tolerance conventional forgings within the allowance left for machining. Since precision forgings have little or no machining allowance, they have little morgin for error. If the die is incorrect, only that portion that is incorrect need be rebuilt but this takes time. Prevention of inaccuracy through proper die engineering and construction is the best answer for this problem.

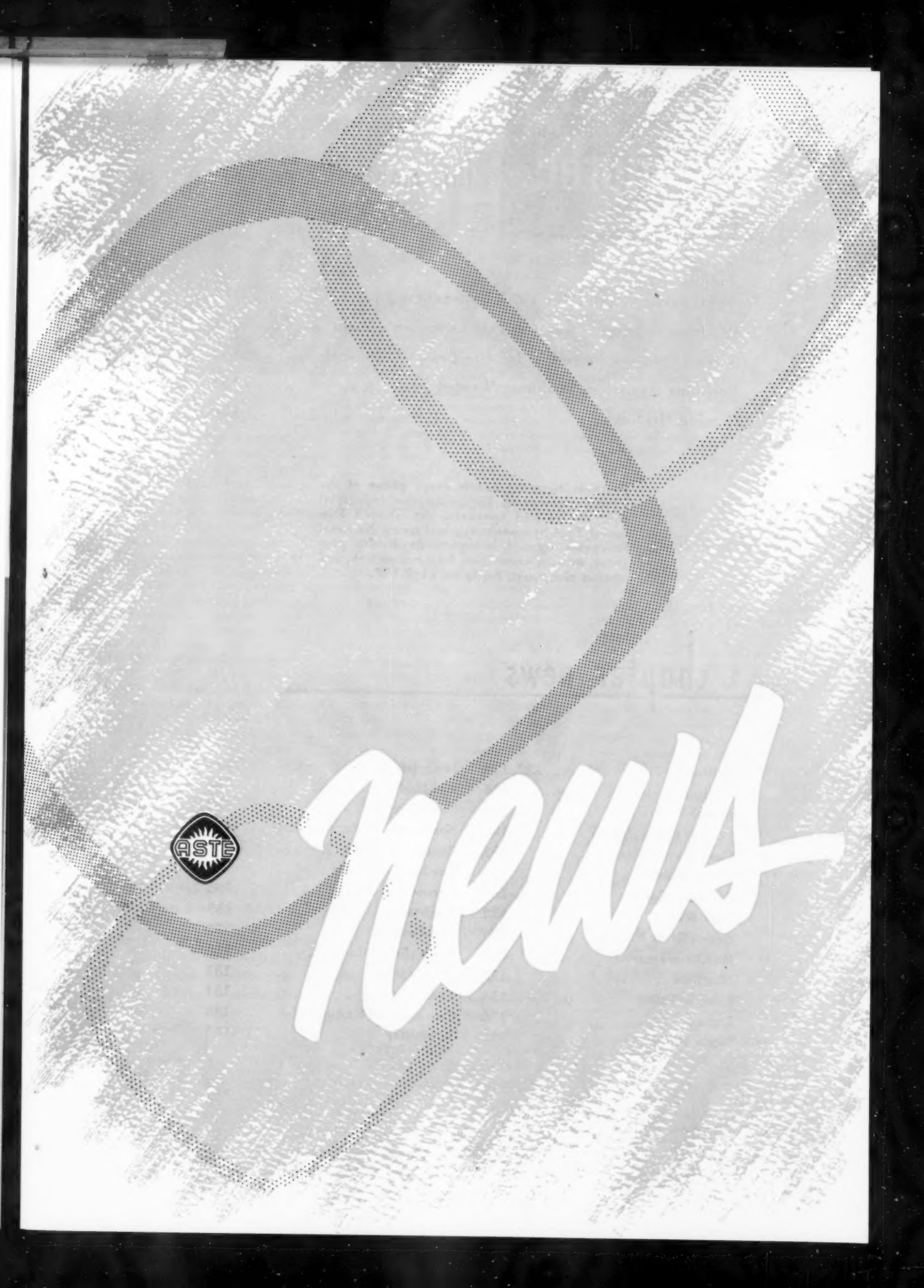
Dies for conventional forgings are normally sunk to a tolerance of ± 0.005 to ± 0.010 inch. If a rib on a precision forging is to have a width tolerance of ± 0.010 inch, for example, dies are constructed to a tolerance of approximately ± 0.001. This extra precision is necessary to allow for proper maintenance of the die surface. Dies have to be polished between runs. If forging tolerances were absorbed by the die sinker, excessive die replacement would be necessary due to clean-up alone.

Experience with cast dies, which could speed die construction, has been limited to small parts because experimental dies for large parts have not met requirements for precision, quality of surface and internal soundness. Further experimentation is being carried on to determine if segments of large dies could be cast or if cast dies could be used as blockers prior to finish forging. Tolerances for blocking dies are not as close as those for finish dies.

Tooling problems confront the precision forging producer and user equally. Since the importance of precision is increasing, close coordination is necessary between the user and the producer. Both must understand what can, *Figs.* 4 and 5, and what cannot be produced. Cooperation must continue through die development and tryout. Only with coordinated efforts can forgings be produced in a continuous flow to meet the present rigorous requirements.

**Fig. 5. Precision forging without draft illustrates complex designs now possible. Largest precision now designed is about 63 inches long.**

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News

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**TWIN STATES—National President Harry B. Osborn, center, was a special guest at the chapter's past chairmen's night. Shown at the speakers' table, from left, are: Glenn Easten, treasurer; D. R. Percival, technical speaker; Jen Cameron, chapter chairman; Dr. Osborn; Harold Noyes, vice chairman; F. P. Dunigan, Jr., technical speaker; and Donald S. Whitney, secretary.**

## D. E. Wernz Discusses Aluminum Dip Brazing

Featured speaker at Central Pennsylvania chapter's Jan. 4 meeting was Donald E. Wernz, chief project engineer at The Glenn L. Martin Co., Baltimore, and also a member of ASTE's National Editorial Committee.

Mr. Wernz addressed about 65 members and guests on the subject "Aluminum Dip Brazing." His discussion revealed detailed information on equipment needed, preheating techniques, cleaning materials, charts showing joints recommended, and brightening agents and their uses.

Announcement made at the meeting included the report of the chapter's nominating committee, and also one by Raymond Meckley, the group's representative to the York Technical Council, who told of the program planned to commemorate National Engineers' Week.

*—Paul F. Leese*

## National ASTE President Is Guest at Twin States Past Chairmen's Night

Harry B. Osborn, Jr., national president of the Society, was a special guest at Twin States past chairmen's night held at the Hotel Moody in Claremont, N. H. During the program, held in honor of all the men who had served as the chapter's top executive, Dr. Osborn delivered an informal address on his recent trip to Japan.

Introduction of past chairmen was handled by Chairman Jen Cameron. Present were: Wilbur Handy, charter chairman, Robert S. Gillette, Ernest V. Saunders, J. Kenneth Aiken, George Morin, William Farrell, Alan Stubbs, William C. Hadfield, Lee M. Davis, Herbert H. Ranney, Floyd J. McArthur, George Julian, and Martin H. Parker.

The technical topic of the evening was "Electronic Equipment for Industrial Machinery" which was presented by D. R. Percival, manager, and F. P. Dunigan, Jr., assistant manager of Machinery Electrification Inc.

At another meeting, Twin States members heard a discussion of "Vibration Problems and Dynamic Measurement." Speaking to them was Edward T. McGuire, field engineer with Consolidated Engineering Corp. He spoke on vibration as related to machine tools and showed reasons for wear, discomfort, noise and failure. A movie entitled "Dynamic Measurement" was also shown.

*—Maurice Blais*

## *ASTE Invites Papers for 1957 Convention*

An invitation for technical papers to be presented at next year's convention has been extended by ASTE's National Program Committee. The convention, to be held in April 1957, will commemorate the Society's 25th (silver) anniversary.

Papers will be accepted for consideration until May 1, 1956. Each proposal should include an outline of the material, author's name, title and company affiliation. Although ASTE membership is not required, authors must agree to abide by the published rules for presentation of papers before a national meeting of the Society.

Proposals should be sent to: L. S. Fletcher, Program Director, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 38, Mich. Authors of papers accepted for presentation will be notified by June 5, 1956.

## Racine Speaker Gives Talk on Boring Tools

Addressing some 85 Racine members and their guests at the January meeting, Donald L. Harris of Giddings & Lewis Machine Tool Co. described the characteristics, limits and uses of boring bars. After his discussion entitled "Old Principles and New Applications for Boring Tools," Mr. Harris showed a film illustrating Giddings & Lewis machines with a variety of boring bar applications.

*—Alvin J. Michna*

## Society Schedules Second Printing for *Die Design Handbook*

Exceeding all expectation, sales of the recently introduced *ASTE Die Design Handbook* have passed the 11,000 mark, in little more than six months after its introduction. Demand has been so great that arrangements have already been made for a second printing with the publishers, the McGraw-Hill Book Co.

Commenting on the acceptance of the new handbook, Frank W. Wilson, editor-in-chief, said "We are extremely happy about the way the *ASTE Die Design Handbook* has taken hold. The Society has received a number of foreign requests for the book and is seriously considering the possibilities of foreign language editions."

The *ASTE Die Design Handbook* is a sister publication to the *Tool Engineers Handbook*, brought out in 1949. The latter volume has since sold more than 70,000 copies all over the world and has been accepted as the industry's authoritative reference source.

**BALTIMORE—These enraptured youngsters were the special guests at the annual Christmas party. More than 60 of them were present for "interviews" conducted by Chairman LeRoy Rubright playing the part of Santa Claus, movies and a hilarious puppet show which lasted for two hours. Christmas stockings filled with toys and candy were given to all.**

### *North Texas Members Meet at Amon Carter Airport*

A demonstration of the Carboloy Machinability Computer was a highlight of North Texas chapter's Dec. 9 meeting. Held at the Amon Carter Airport, located between Fort Worth and Dallas, the technical program was presented by Bruce B. Burnett, representative of the Carboloy Dept., General Electric Co. —*W. P. Tharp*

### Chautauqua-Warren Views Computer Demonstration

A number of out-of-town guests were present at Chautauqua-Warren's December meeting, held at the Masonic Temple in Jamestown, N. Y. Visitors

Featured attraction at the meeting was the demonstration and lecture on the Carboloy Machinability Computer.

—*Donald Curtis*

### *"Hydrospinning" Is Topic of San Antonio Speaker*

Field engineer for the Process Machinery Div. of Cincinnati Milling & Grinding Machine Co., Inc., Charles R. Heimlich was the technical speaker at San Antonio's Jan. 11 meeting. He presented a film, lecture and slides on the subject "Hydrospinning." A question and answer period followed his lecture.

—*Stanley G. Gower*

### Past Chairmen's Night Held at Toledo

Thirteen of Toledo chapter's past chairmen were on hand for the Jan. 11 meeting held in their honor. Introductions were handled by A. M. Schmit. One of the highlights of the session, held at Maumee River Yacht Club, was the presentation of the chapter's annual scolarship award to Arnold Field. The second-place award was given to Robert N. Lindner.

Technical speaker was Otto W. Winter who discussed the shell-molding processes, using photographs, a film and samples to illustrate the various molds.

—*Harold H. Krueger*

### Hamilton Members Hear W. O. Johnson

"Flame Plating with Tungsten Carbide" was the subject discussed at Hamilton chapter's Jan. 13 meeting. Speaking to an audience of about 80 members was W. O. Johnson, mechanical engineer, Linde Air Products Co., a division of Union Carbide of Canada, Ltd.

Mr. Johnson described the theory by which tungsten carbide is applied to surfaces in thickness of 0.002 to 0.012, the preferred range of requirements for most applications. Flame plating produces hardness for wear resistance and eliminates fusion and friction at high speeds.

Eight new members were welcomed at the meeting and presented with membership pins. —*W. A. Marcellus*

### Des Moines Chapter Hears Development Engineer

An illustrated lecture on "Pressworking of Metals" was presented Dec. 21 at a meeting of Des Moines members and guests. Program speaker was G. M. Sommer, chief development engineer, Clearing Machine Corp. In addition to the discussion, Mr. Sommer showed a film entitled "A Better Way."

—*John Willing*

### *Fort Wayne Members Hold Holiday Party*

Acquainting members of the Fort Wayne chapter with the Carboloy Machinability Computer, E. J. Monacelli addressed them on Dec. 14 at the Chamber of Commerce.

On Dec. 10, more than 200 attended the annual family Christmas buffet supper and party. To the delight of the youngsters, Santa Claus, carrying a big bag of gifts, was a special guest. The success of the event was attributed to the efforts of Eugene J. Gildea and his committee. —*R. H. Bienz*

### Electrical Controls Is Topic for E. E. Opel

"Electrical Control of Machine Tools" was the subject covered at the Jan. 5 meeting of Northwestern Pennsylvania chapter. Speaking to a group of 70 members and guests was E. E. Opel, electrical engineer, National Automatic Tool Co., Inc.

Mr. Opel stressed the importance of sound electrical equipment in automation. —*Frank H. Grimone*

**Richard Kitchen, right, receives the ASTE scholarship award from Vice Chairman John C. Lawrence. A student at Rochester Institute of Technology, Dick will receive $800 for three years of study in tool engineering.**

## Rochester Session Covers Proper Design for Gears

Meeting at the Barnard Exempt Club, some 135 members of Rochester chapter were on hand Nov. 7 for a technical discussion on gears and gearing. Technical speaker for the evening was Donald S. Carr, technical engineer with Fellows Gear Shaper Co. His talk on proper design for gears was highlighted by a colored film showing the layout and method of designing involute gears together with cutting the gears on Fellows Gear shapers.

*—Floyd Weed*

## *Twin Cities Program Covers "Plastic Tooling"*

Nearly 100 members of Twin Cities chapter were present for the Jan. 4 technical session on "Plastic Tooling." Speaking to the group was Paul Enblom, mechanical engineer, New Products Div., Minnesota Mining and Manufacturing Co. He described the advantages of using plastic tooling for temporary dies, jigs and fixtures, and told how this low-cost method of fabrication eases the reproduction of elaborate shapes and contours.

*—R. Roy Wressell*

## ASTE President Osborn Is Grand River Speaker

An audience of 70 ASTE members, including every past chairman of the chapter, was present for Grand River Valley's January meeting. Featured speaker was Harry B. Osborn, national president of the Society and technical director of Tocco Div., The Ohio Crankshaft Co.

Introduced by Percy Barber, past chairman, Dr. Osborn gave a coffee talk on the growth and importance of ASTE to the tool engineer. He followed this discussion with a lecture on "Tooling for Induction Hardening." A series of colored slides provided illustration. Questions and answers concluded the technical program.

Dinner for the guest of honor, the executive committee and past chapter chairmen was served before the meeting at the Iroquois Hotel.

*—W. C. Little*

**PEORIA—Lynn A. Williams, second from right, vice president of Ano-Cut Co. was the program speaker at the December meeting. Arrangements for the session were made by the student group of the chapter. From left: Robert Kautz, toastmaster; Ray Zimmerman, advisor to the student group; Mr. Williams; and Don Cox, student group chairman.—*G. W. Wieland***

## Hartford Chapter Holds Education Night

The University of Connecticut in Storrs, Conn. was the setting for Hartford chapter's annual education night. Held Dec. 5, the program drew a good representation of members, guests and their teen-age sons. Starting with an afternoon tour of the campus, the agenda included dinner and a technical session presented by four university professors.

Subjects covered were: Engineering Education at the University of Connecticut; Teaching Metal-Cutting Today; Metallurgical Aspects of Machinability; and Unusual Properties of Metals at Low Temperatures. Lectures were given by: Charles H. Coogan, Jr., head of the department of mechanical engineering; Harry L. Bryden, assistant professor of mechanical engineering; Edward L. Bartholomew, professor of mechanical engineering; and Charles A. Reynolds, assistant professor of physics.

## Positions Wanted

INDUSTRIAL ENGINEERING AND SALES—age 34, machine shop, college and supervisory background. Experienced in time study, methods, and industrial engineering with major cutting tool manufacturers. Have 2 years sales knowledge contacting principal midwest manufacturers concerned with metal removal processing. Fifteen years total experience in the cutting tool business. For complete resume, write to Box 069, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

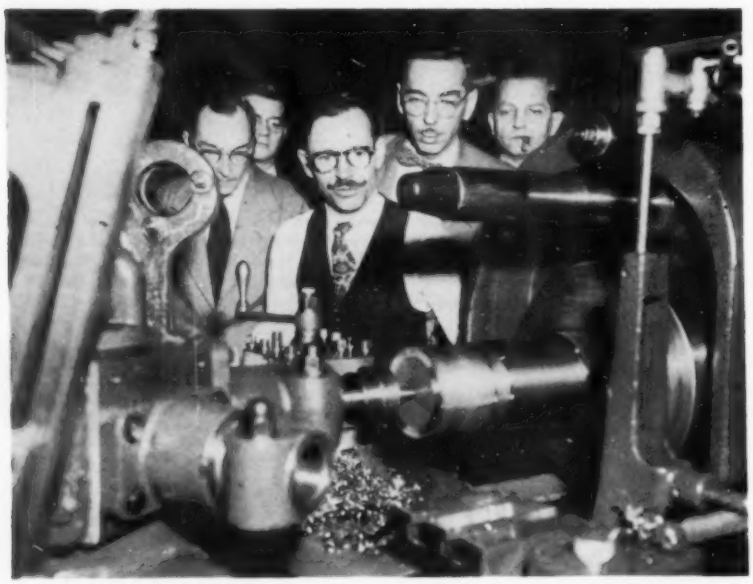
GRADUATE PRODUCTION ENGINEER—with four years' experience seeks position in Detroit area. Presently Shops Officer in USAF, supervising 130 personnel in machine, sheet metal, welding, heat treating, and plating shops. Good basic experience in material procurement and control, production control, product design, jig and fixture design, personnel administration and management. Other experience includes machinability research, college teaching and special machine tool design. Winner of ASTE International Education Award; organizer and past chairman of University of Michigan student chapter of ASTE. Resume available. Write to: Lt. R. B. MacGregor, 414 New Castle Ave., Dover, Del.

## Positions Available

DETROIT AREA AUTOMOTIVE CONCERN—offers opportunity for aggressive men, 28-40, with technical background for quality trouble shooting in final assembly. Salary commensurate with qualification. Write to Box 068, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

MANUFACTURERS' REPRESENTATIVES—long established Detroit manufacturer of special high-speed and carbide cutting tools. Excellent opportunity with a progressive organization. For further information, send complete details of background to Box 067, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

SALES ENGINEERS AND DEVELOPMENT ENGINEERS—long established central New England machine tool manufacturer has openings for sales proposal and development engineers. Sound opportunities for men with engineering background experienced in machine tools or closely allied fields. Salaries open; advancement dependent on demonstrated ability. Liberal vacation and benefit program provided. For further information, send complete details of background to Box 063, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.



**LEHIGH VALLEY—Host for the Dec. 9 meeting was Carney-Stansfield Machinery and Equipment Co. After a smorgasbord dinner, the firm gave demonstrations of bar machines, turret lathes, engine lathes, automatic screw machines, drilling and tapping machines, radial drill presses, tool and cutter grinders, and a variety of specialty machines. Shown here, watching a demonstration conducted by James Edge, center, are (from left): George Savitz, W. Buckfeller, Chairman Ralph Mueller and Walter Herzer.—*Chauncey R. Kay***

## *Industrial Diamonds Discussed by Koebel*

Uses of diamonds in industry were discussed Jan. 4 at a meeting of Fairfield County ASTE members. Program speaker was Charles J. Koebel, president of Koebel Diamond Tool Co., Detroit, whose topic was "The Evolution in the Use of Diamonds."

Guests at the dinner meeting, held at Hitching Post Inn, included Roger F. Waindle, past president of ASTE; and S. B. Withington, president of Bridgeport Lycoming, a division of Avco.

*—Henry E. Busby*

## Baltimore Speaker Talks on Plant Relocation

The many problems encountered in the relocation or the expansion of a plant were outlined at Baltimore chapter's Jan. 4 meeting. Addressing the group at the Engineers' Club was H. A. Frisch, supervisor of advance manufacturing at the engineering welding department in the York, Pa. plant of General Electric Co.

He told of the numerous factors that must be considered in expansion, such points as: selecting a city that best suits requirements of a specific business; the evaluation of an established building versus a new construction; the availability of materials and personnel; and the coordination of installation of machinery.

Coffee speaker at the meeting was John Donahue, president of the Baltimore Life Underwriters Assoc. and sports official in the Dulaney conference.

*—Raymond T. Crew*

## Joseph Petz, Harry Conn Give Mid-Hudson Program

A coffee talk on "Floods in Pleasant Valley" and a technical discussion entitled "Tooling for Automation" were presented at Mid-Hudson chapter's January meeting. Addressing the audience of nearly 80 members and guests were Joseph L. Petz, past chapter chairman and head of ASTE's National Editorial Committee; and Harry Conn, chief engineer at Scully-Jones & Co.

Mr. Petz narrated a series of slides taken of the flood damage caused by 'Hurricane Diane' in Pleasant Valley, location of the J. L. Petz Co.

In his discussion, Mr. Conn showed how high production machine tools may be tooled to cut down lost time caused by tool changes and breakage. He also described the advantages of high production tooling against standard and temporary tooling.

*—Davis Gale*

**WORCESTER—Holden Country Club furnished the setting for the annual ladies' night and Christmas party. Pictured, from left, at the head table, are: Mrs. Cass Karpen, Mr. and Mrs. Leslie Campbell, Irving England, Miss Muriel Clancy, Mr. and Mrs. Leo Tarasov, and Mr. and Mrs. John Lalor.—*Donald Meade***

## Computer Demonstrated at Kansas Student Meeting

A demonstration of the Carboloy Machinability Computer was featured at the Dec. 8 meeting of the University of Kansas student chapter. Speaking to the group of 30 was L. M. Smith, sales engineer for Carboloy Dept., General Electric Co. —*Charles E. Wright*

## *North Carolina Members Hear William H. Kemper*

Dealing primarily with the actual tooling for machining stainless steel, William H. Kemper of Carpenter Steel Co. was the program speaker at two January meetings of ASTE groups in North Carolina. The first, held Jan. 9, drew an attendance of 55 Piedmont chapter members. The following day, the program was given for the Raleigh-Durham subsection of Piedmont chapter.

Mr. Kemper went into detail on the tool angles, feeds and surface speed necessary for good production, fine finish and tool life. He also conducted a lively discusion on the value of stoning or polishing tools.

—*Howard Blackwood*

**PURDUE UNIVERSITY—"Automation in Core Production" was the subject of Richard Olsen, second from right, president of Dike-O-Seal, who addressed the Jan. 12 meeting. Shown with him, from left, are: Max Poling, John Roesch, Bill McCormick and Bob Ling, also with Dike-O-Seal.—*Richard L. Burge***

## Benton Harbor-St. Joseph Program on Shell Molding

Members of American Foundrymen's Association joined the Benton Harbor-St. Joseph chapter for the January meeting on shell molding. A total attendance of close to 100 was present to hear Otto W. Winter, manager, Shell Mold Div., Pettibone Mulliken Corp., Chicago, Ill.

His program included discussion of automatic molding, a film on making shell molds, and pictures of shell castings. Some of the points covered were: low cost shell bolding versus regular molding; and initial pattern cost and equipment for shell molding.

—*Orvis L. Johnson*

## Tire Manufacturing Plant Toured at Chicopee Falls

Well over 100 members of Springfield, Mass. chapter traveled to Chicopee Falls on Jan. 9 for a tour of the Fisk Tire plant of United States Rubber Co. Dinner served in the plant cafeteria preceded the guided trip through nearly every phase of tire building.

In conjunction with the tour, Ralph E. Streeter, tire construction engineer, explained the main points of the actual sequence of operations in tire-building, and James E. Duras, director of training and personnel research, presented items of interest in that filed.

At the December meeting, Springfield members heard a coffee talk on the activities at Associated Engineers, Inc., by Robert W. Marquiss, second vice chairman of the chapter, and a discussion of "The Manufacture of Structural Parts from Metal Powders" by Carl G. Johnson, associate professor at Worcester Polytechnic Institute. Prof. Johnson's talk covered some of the more important phases influencing the intelligent use of powder metallurgy as a method of metal fabrication. Case histories of forged and cast parts versus sinterlings were also presented.

—*Allen M. Johnson*

## Holiday Party Draws Little Rhody Crowd

A joint party with the Rhode Island Tool and Die Manufacturers' Assoc. was staged by Little Rhody ASTE members on Dec. 3. Total attendance was well over the 200 mark. The program, in addition to presentation of many prizes, offered dinner, dancing and entertainment. It was held at Johnson's Hummocks. —*Richard Kilbane*

# coming ASTE meetings

BOSTON—March 8, Annual ladies' night and installation of officers.

COLUMBUS—March 14. "Meteorology" by Robert McMasters. Ladies' night and installation of officers.

DAYTON—March 12. Program by representatives of Pratt & Whitney. Installation of officers.

DETROIT—March 15. Senior section's ladies' night. March 8, carbide section's Chrysler Night. March 22, education section, "Developing Tool Engineers into Executives."

FORT WAYNE—March 14, 6:45 p.m. Ladies' night and installation.

GREATER NEW YORK—March 5, 6:30 p.m., New York Times Bldg. "Shell Molding" by Don Murray, sales manager, Eastern Div., The Borden Co.'s Chemical Div.

HAMILTON DISTRICT—March 9. "Cutting Tools" and "Material and Heat Treating" by representatives of Vanadium Alloys.

LEHIGH VALLEY—March 9, 8 p.m., Hotel Traylor, Allentown, Pa. Installation of officers.

LONG ISLAND—March 3, 7:30 p.m., Garden City Hotel, Garden City, N. Y. Annual installation and dinner dance. March 12, 8:30 p.m., Garden City Hotel, "Modern Broaching Practice" by Joseph A. Psenka, field engineer, National Broach & Machine.

LOUIS JOLIET—March 20, "Automation" by J. H. Manefield, chief engineer, Greenlee Bros. & Co. Installation of officers.

MERRIMACK VALLEY—March 8, 6:30 p.m., Rex Grille, Lowell, Mass. Speaker Dr. Harry B. Osborn, Jr., national ASTE president and technical director, Tocco Division of the Ohio Crankshaft Co. Annual executive night.

MONADNOCK—March 15. "High-Speed and High Cycle Milling" by Z. C. Van Schwartz of Baldwin-Lima-Hamilton Corp.

NEBRASKA—March 22, Lincoln, Neb. "Thread Rolling" by a representative of Salvo Tool & Engineering.

NORTHERN MASSACHUSETTS—March 13, Greenfield. "Quality Castings" by C. E. Herrington of Mechanite Metal.

NORTHERN NEW JERSEY—March 13. "Air Force Conservation Program as It Affects Tool Engineering" by Gen. L. P. Whitten, U.S.A.F. Executive night.

PHILADELPHIA—March 15. "Effective Carbide Tool Control" by a five-man panel led by Gordon Loftin of U.S. Pipe & Foundry Co.

PIEDMONT—March 12, Mayfair Cafeteria, Greensboro, N. C. "Hydraulics in Industry" by M. R. Tyson, district manager, Vickers, Inc.

PITTSBURGH—March 2, 6:30 p.m., Gateway Plaza. "Automatic Presses and Combinations of Dies for Quality Stamping" by E. V. Crane, chief development engineer, E. W. Bliss Co.

PORTLAND, ORE.—March 29, 6:30 p.m., Theile Restaurant, West Burnside St. "Tools of Abundance" by Vincent Buerge, West Coast carbide sales engineer for Sonnet Supply Co.

SOUTHEASTERN MASSACHUSETTS—March 27, Stevenson's, Westport, Mass. Installation of officers by Richard A. Smith, ASTE national director. Also three-dimensional slides and movies. Ladies' night.

SPRINGFIELD, MASS.—March 12, 7:30 p.m., DeMarco's, West Springfield, "Progressive Dies" by B. Jahn, president of B. Jahn Co.

TWIN STATES—March 8, Springfield, Vt. "Accent on Accuracy" by J. C. Dixon of Pratt & Whiney. Installation of officers.

WORCESTER—March 6, 7 p.m., Putnam & Thurston's. "Electronic Equipment for Industrial Machinery" by D. R. Percival of Machinery Electrification, Inc. Installation of officers.

**LONG ISLAND—Chapter Chairman McLaughlin, left, greets George E. Papp of S. C. Johnson & Son, Inc. at the January meeting. Mr. Papp spoke on metalworking with wax, listing the sources of wax, main properties wax must have for use in metalworking, and the types of lubrication that waxes can provide.** ***—William H. Bruning***

## Lima Members Stage Annual Ladies' Night

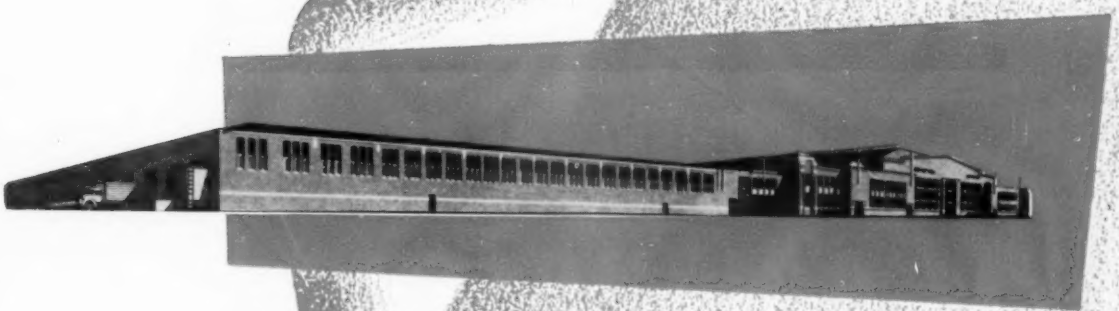
Dinner and dancing were the main attractions at Lima chapter's annual ladies' night held on Dec. 10. Attended by more than 180 members and guests, the festivities included presentation of 25 prizes and entertainment provided by W. Brillharts and daughter Kay, Tom Epley and Bill Makley.

Earlier in the month, about 100 members toured the Ex-Cell-O plant in Lima. Arranged by Donald H. Cox, program chairman, the tour covered the engineering and design sections, as well as the shop where aircraft parts for jet engines are machined.

*—G. Stemen, John Harman*

**BOSTON—Presenting the technical program at the Dec. 8 meeting were Norbert A. Arnold, left, development engineer, Keystone Carbon Co.; and William L. Batten, manager of the powder metallurgy dept., Vanadium-Alloys Steel Co. They discussed "Pre-Alloyed Steel Powders and the Designer" and "Fabrication of Powdered Metal Parts." Technical chairman for the meeting, attended by about 160 members, was R. R. Elder, Jr.—*** ***Melvin P. Burns***

# ASTE Convention



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# ASTE presents

# "TOOLING FOR TOMORROW"

Climaxing two years of preparation, the most imposing production ever staged by ASTE will be presented in Chicago the week of March 19-23. Sharing top honors on the bill entitled "Tooling for Tomorrow" are the 1956 Industrial Exposition and Annual Convention.

The cast for the program is a large and distinguished one. Starring roles have been assigned to nearly 500 companies which will exhibit the latest in manufacturing methods and equipment; 60 technical speakers, each a recognized expert in his field, who will cover tomorrow's most vital production subjects; and 12 sponsors of plant inspection visits who will welcome ASTE for a special series of "engineering in action" tours.

### Co-Sponsoring Organizations

Sharing the limelight will be three co-sponsoring organizations, also playing leading roles. They are the National Tool and Die Manufacturers Association and the National Fluid Power Association, which are presenting two of the individual sessions; and Armour Research Foundation of Illinois Institute of Technology, which is aiding in the sponsorship of the technical program's much heralded Shaped Diamond Symposium.

Housing most of the technical sessions and the exposition will be the International Amphitheatre, world's largest exhibition hall. More than 164,000 square feet have been set aside to exhibit new machines, tools and processes, many unveiled for the first time.

Each exhibit will feature a 'blue ribbon,' signifying the most outstanding item on display, as determined by the exhibitor. Specially designed for this ASTE Exposition, the blue ribbons will aid visitors in quickly noting the high spots of the show.

### Shaped Diamond Symposium

One of the most widely discussed events of the show and convention is the Shaped Diamond Symposium. Sponsored jointly by ASTE and Armour Research Foundation, the Symposium has a varied and highly interesting program.

An exhibit at the exposition will include a million dollar display of industrial diamonds; a working model of a diamond mine, shipped to this country from South Africa and Europe; and a shop actually selecting, cutting and preparing diamonds and mounting them in tools.

J. S. Gillespie J. T. Rettaliata

Launching the Symposium will be the Diamond Dinner to be held Monday evening at Illinois Institute of Technology. Principal speaker will be J. S. Gillespie, who is in charge of the man-made diamond project at Carboloy Department of General Electric Co. He will discuss the new man-made diamonds, some of their properties and some of their possible future uses.

Master of ceremonies for the event will be Dr. John T. Rettaliata, president of Armour Research Foundation and president of Illinois Institute of Technology, the educational institution which trains more engineering students than any other college or university in the nation. *(Continued)*

## Board of Directors' calendar

**Saturday, March 17**

**Board of Directors' meeting scheduled for 9 a.m. to 5 p.m. in the Waldorf Room, Conrad Hilton Hotel. All ASTE members are welcome to attend.**

**Board of Directors' luncheon to be held at noon in the Beverly Room.**

**Sunday, March 18**

**Continuation of Saturday's Board meeting, to open at 9 a.m. in the Waldorf Room.**

**Luncheon for Board members scheduled at noon in the Beverly Room.**

*(Continued from preceding page)*

On exhibit at the dinner will be displays of man-made, gem and industrial diamonds worth more than $4,000,000. They are being loaned by American jewelers, Industrial Distributors Ltd., and General Electric Co.

### Evening Hours for Show

The first time that one of ASTE's expositions has been kept open during the evening, show hours on Wednesday, March 21 will be extended to 10 pm. During the rest of the week the show will observe its usual hours, 9 a.m. to 6 p.m.

Engineering education will be the subject of a conference presented by ASTE's National Education Committee. Designed specifically to make known and to discuss results of three surveys of engineering institutions, engineering graduates and industries employing engineers, the Regional Educators Conference will be held March 24.

Invitations to attend the conference are being issued to 250 leading educators and industry training directors. Conducting the conference will be Prof. Robert E. McKee, chairman of the National Education Committee and member of the production engineering staff at the University of Michigan.

In addition to the all-important meetings of the Society's Board of Directors and National Delegates, convention activities include the traditional Past Presidents' luncheon on March 23 and the Canadian Chapter Breakfast on March 21.

## ASTE Banquet Audience to Hear David Swan, Director of Research, Electro Metallurgical Co.

Appearing as keynote speaker on the program of the 1956 convention will be David Swan, director of research at Electro Metallurgical Co., a division of Union Carbide and Carbon Corp. He will address ASTE's 24th Annual Banquet to be held March 22.

Associated with Union Carbide and Carbon Corp. since 1946, Mr. Swan was first assigned to the Metals Research Laboratories of the Electro Metallurgical Co. as research engineer. In 1952 he was appointed assistant director of research and three years later he became director of research for the company.

Following graduation from Rensselaer Polytechnic Institute in 1940, Mr. Swan joined Crucible Steel Co. During the war he served in the Naval Reserve, attaining the rank of lieutenant commander.

A member of ASM, AWS and AIME, Mr. Swan serves on several advistory boards and is the author of a number of papers given before many technical societies.

*for greater convention DIVIDENDS—*

# PLAN IN ADVANCE!

Greeting the 40,000 engineers expected at this year's ASTE Convention will be the most extensive Industrial Exposition and technical program ever presented by the society.

To make the most of the many activities, advance planning will pay high dividends. Here are a few pointers which may help in getting top value from your ASTE week in Chicago.

Make your travel arrangements as soon as possible. Well-serviced transportation center though it is, Chicago may have crowded train and airplane facilities on the days you want to travel. And to insure having the exact hotel accommodations you're after, send your request immediately for reservations to: The Chicago Convention Bureau, Inc., 134 N. LaSalle St., Chicago 2, Illinois.

In mapping out your plans to cover the talks and tours that will interest you most, study the program carefully to find out what's going on when. It may be a good idea to write a memo to yourself, working out on paper just what events you want to take in and planning your time accordingly.

And speaking of time, don't try to "do" the exposition all in one day. There's a lot of ground to cover to see 500 exhibits and, by splitting up your hours at the show, you'll enjoy it more and learn more with a minimum of fatigue.

Don't forget to visit the ASTE Center at the International Amphitheatre where you'll find lounge facilities for meeting friends and Society headquarters personnel on hand to answer questions on chapter services. Information about ASTE publications, including THE TOOL ENGINEER, will also be available.

Since there are limited numbers of tickets for both the Diamond Dinner and the Annual Membership Banquet, they should be ordered well in advance. For the Diamond Dinner, send a check or money order for $4 per plate to: ASTE Diamond Dinner, 10700 Puritan Ave., Detroit 38, Mich.

Tickets for the Annual Banquet, to be held in the grand ballroom of the Conrad Hilton Hotel, are $10 each. Requests, accompanied by checks or money orders, should be sent to American Society of Tool Engineers, Banquet Reservations, 10700 Puritan Ave., Detroit 38, Mich.

Participation in the plant tours, always popular at ASTE conventions, will also be limited, making early registration a necessity. If you don't want to wait until getting to Chicago, you can make tour reservations in advance. Mail the special form enclosed in the Convention Activities Program sent recently to all ASTE members and $1.50 for each tour to: ASTE Plant Tours, 10700 Puritan Ave., Detroit 38, Mich.

Complete information on all activities planned during convention week is contained in this issue of THE TOOL ENGINEER. Consult the table of contents and special section contents pages for the specific material you're seeking.

# industrial conferences

Previews of a number of industrial conferences to be presented at the convention are published here, completing the advance coverage of technical papers which began in THE TOOL ENGINEER for February. Also appearing on the following six pages are brief biographical sketches and photographs of speakers.

A panel on carbide die problems will discuss what the tool designer, the product designer, the material producer and production manager must tell the diemaker to help him make a satisfactory product. Papers in this panel, identified under index number 24C2, will include one on "Machining Carbide Dies by the Electrical Discharge Methods" authored by **J. K. Carroll,** executive vice president of Electrosize, Inc. This explains the process of removing metal by disintegration through intermittent high frequency discharge across a controlled gap. **Herbert Harig** of Harig Mfg. Corp., will focus attention on the job of the die builder and will depict the processing of dies from beginning to end.

**Donald E. Oberg,** president and general manager of Oberg Mfg. Co., Inc. will delve into technical details of die design as it affects the job of making a carbide die. Considerations, such as type of construction, interchangeability, maintenance and protective devices for dies will be included. Problems for the die designer such as control of shrinkage, and other size control, inspection of materials and effect of method of diemaking on the design, will be considered by **P. F. Rehner,** manager of sales, Carmet Div., Allegheny Ludlum Steel Corp. in his discussion, "Application of Cemented Tungsten Carbide for Dies." **Thomas C. Roberts,** president, Kobzy Tool Co. in his paper. "The Stamper and Die Building," will discuss economic and related questions from the viewpoint of the user.

The challenge plastic tooling poses to the tool engineer is portrayed by **Fred Lyijynen,** supervisor, Plastics Development Dept. of Chrysler Corp., in a paper entitled "Advantages of Plastic Tooling"

Carroll

Harig

JOHN K. CARROLL has served as executive vice president of Electrosize, Inc., since 1953. He had previously been associated with Brust Tool Mfg. Co. as executive vice president, assistant to the president and chief engineer, and also with A. B. Mfg. Co. as superintendent. Educated at Illinois Institute of Technology, Northwestern University and New Mexico A & M State College, Mr. Carroll is a member of several technical and professional organizations.

H. HARIG, president of Harig Mfg. Corp., is first vice president of the National Tool & Die Manufacturers Association and on the board of directors of The Tool & Die Institute, which he has also served as president. He joined Brust & Harig Tool & Die Corp. in 1934 as an apprentice and six years later became foreman and partner in Harig Mfg. Corp. Promoted to process and sales engineer in 1941 Mr. Harig was named vice president and treasurer in 1944 and was elected to the presidency in 1954.

(24C1A). He indicates the place of plastic tooling in high-volume production, from the economic as well as practical viewpoint.

One of the new developments in tooling is the increasing attention devoted to ceramics. Rodman Laboratory of the Watertown Arsenal has pioneered in the development and application of cutting tools of ceramics. **W. B. Kennedy,** chief, Experimental Machining Branch, will interpret this in "Ceramic Tooling Brought Up-to-Date" (24T1). He will demonstrate applications with a short film. His evaluation of this subject will include its significance to the tool engineer.

"Precision Production Grinding Machines" (24-T5) is the topic of a paper by **A. H. Dall,** director of Standard Machine Tool Engineering, Cincinnati Milling Machine Co. Latest techniques of grinding and of gaging for grinding operations will be considered. In addition, the speaker will investigate a number of special production grinding problems and the equipment developed to solve them. To bring the tool engineer the latest information on grinding techniques, the electrical discharge process will also be covered in a paper by **V. E. Matulaitis,** director of research, Elox Corp. of Michigan. The title of his talk is "Electrical Discharge Grinding of Tools" (24T6). This paper will evaluate advantages and disadvantages of the method for processing tools. Answers will be given to such questions as heat checking, rate of metal removal, cost factor, productivity, tool life and the like.

The growing importance of diamond technology in the metalworking industry is being recognized by a Shaped Diamond Tool Symposium. "Crystallography and Grinding Hardness of the Diamond Crystall" (24T8) is the text of a paper to be given by **Dr. J. F. H. Custers** of the Diamond Research

*(Continued)*

DONALD E. OBERG, president and general manager of Oberg Mfg. Co., left Allegheny Ludlum Steel Corp. in 1948 to establish his own carbide die business. As assistant sales manager of Allegheny Ludlum's Carbide Division in Detroit, he had served as engineering specialist on carbide applications for dies. Mr. Oberg, who joined the company in 1934 while attending night classes at Carnegie Tech and University of Pittsburgh, is a member of ASTE and the Society of Carbide Engineers.

Oberg

P. F. REHNER has been manager of sales for the Carmet Division of Allegheny Ludlum Steel Corp. since 1951. He joined the corporation in 1930, his first job being punch press helper, and later served his apprenticeship as a tool and die maker. After serving as stamping department superintendent, Mr. Rehner was put in charge of coordinating the die design, die construction and press production departments of the Lamination Division. He was transferred to the Carmet Division in 1946 and was appointed assistant sales manager in 1950.

Rehner

THOMAS C. ROBERTS was elected president of Kobzy Tool Co. in 1946, after serving as general manager for four years. He joined the company in 1933, serving his apprenticeship as a die maker. In 1939 he became associated with the purchasing department and was then made general manager. Mr. Roberts is a past president and a former director of The Tool and Die Institute of Chicago and is at present a trustee for the National Tool and Die Manufacturers Association.

Roberts

FRED LYIJYNEN is supervisor of the plastics development department, Automotive Body Division of Chrysler Corp. While studying mechanical engineering at Wayne University, he served his apprenticeship as a tool and die maker at Murray Corp. in Detroit. Assigned to plastics development when he joined Briggs Mfg. Co. in 1939, he continued his research activities when the company was later absorbed by Chrysler Corp.

Lyijynen

WALLACE B. KENNEDY, chief of the Experimental Machining Branch at Rodman Laboratory, Watertown Arsenal, possesses approximately 20 years of broad experience in the field of tool engineering and machining of metals. Lecturer and author of numerous technical articles, he has served as consultant to O.K. Tool Co., Oxford Paper Co., Houghton-Richards Steel Co. and Vascoloy Ramet Co. His educational background includes a four-year course at General Electric Technical School which covered basic courses at MIT, Tufts and Franklin Institute.

Kennedy

ALBERT H. DALL, director of standard machine tool engineering at The Cincinnati Milling Machine Co., has been associated with the company since 1925 when he began studies for a degree in mechanical engineering at the Cooperative Engineering College at University of Cincinnati. After graduation, he spent a year on standardization and was then assigned to research projects including study of precision grinding, grinder spindle bearings, hydraulics and vibration.

Dall

Laboratory. This subject is of basic importance since it affects the selection, preparation and design of diamond tools. Numerous illustrations are to be presented to clarify technical points. Another aspect of this field is to be covered by **J. B. Speirs,** chief engineer, American Coldset Corp. This discussion covers problems of thread and form grinding with industrial diamonds, particularly with reference to jet engine parts. Causes of failures of diamond tools are considered along with problems of standardization in "Shaped Tools for Form Grinding" (24T16).

In the engineering profession, increased attention is being focused on professional registration. The reasons for this may be found in some of the papers being presented at this meeting. For instance, "Why Register" (24T17) by **Paul H. Robbins,** executive director, National Society of Professional Engineers, tackles these questions. Challenges, opportunities and responsibilities facing engineers are some of the topics that will be considered as a part of this broad subject. Also, individual benefits an engineer secures through registration will be explored.

Another session concerned with helping the tool engineer to understand research, particularly machinability, is entitled "Metal Cutting Evaluation" (24T19) and is to be presented by **F. J. Daasch,** chief machinability engineer, Rock Island Arsenal Laboratory. This paper will attempt to dispel some of the confusion surrounding this vital topic. The speaker will consider variables, tool life, tool forces, power consumed, surface quality as well as special tests. These factors and the survey of fundamentals of such research will give a good picture of the present state of this field of activity.

One of the recent advances in gear production has been the development of automation lines. **T. S. Gates,** chief engineer of National Broach & Machine Co., will speak on "Gear Gaging Automation" (24T24) as part of the conference on economical production of fine pitch gears. He indicates that in-process inspection of gears is one of the more difficult problems faced by tool engineers in automating gear production. Some of the solutions to such problems will be brought out and illustrated.

Another aspect of automation is to be considered in a session entitled "Automation—Its Effect on Jigs and Fixtures" (24T31). The speaker will discuss special requirements of work holding introduced by automation. These will include conditions introduced by automatic gaging, automatic assembly operations and maintenance. Other factors entering into design of jigs and fixtures for automation

Trigger

Gleason

Seacord

Hoerer

K. J. TRIGGER, professor of mechanical engineering at the University of Illinois, has been active in the teaching profession for more than 20 years. Receiving his B.S., M.S. and M.E. degrees from Michigan State University, he was an instructor at Swarthmore College and Lehigh University. He joined the University of Illinois in 1938 as an associate professor. Also a consulting engineer, he is a member of several engineering societies and author of numerous scientific papers.

THOMAS C. GLEASON, associated with Chrysler Corp. for more than twenty years, has been assistant chief engineer in charge of chassis development since 1953. Previously, he had been engineering laboratory coordinator on gas turbine engine development, and supervising engineer of the air conditioning and fluid dynamics laboratory. Author of numerous technical papers, Mr. Gleason has been a member of the Society of Automotive Engineers since 1931.

W. H. SEACORD, supervisor of manufacturing standards research at International Harvester Co., has been with the company for nearly twenty years. A mechanical engineering graduate of Cornell University, his most recent assignments include positions as assistant general supervisor of mechanical engineering research, mechanical engineer, assistant mechanical engineer and assistant plant engineer. His society affiliations include SAE, ASA and ASTE.

MARTIN HOERER holds the positions of vice president of Golconda Corp. and secretary of Super-Cut Inc. He received his bachelor of science degree in engineering from Cooper Institute, New York. His engineering affiliations include membership in the Industrial Diamond Association and the Building Stone Institute.

equipment to be considered include materials, cost control, safety, scrap, and shop operating personnel. The speak is **H. M. Adams,** automation specialist, Chrysler Corp.

Another of the ever-present problems of the tool engineer will be considered under the heading "Surface Finish and the Production Engineer" (24T33) by **Dr. C. R. Lewis** and **A. L. Thomson** of Chrysler Corp. This presentation will cover such items as specifications of surface finishes; practical interpretation; economic considerations; methods for producing surfaces such as honing and superfinishing; responsibilities of design and tool engineers for surface finish and the coordination of their efforts.

Successful application of the results of recent metal cutting research is the subject of a paper "Crater Wear of Cutting Tools" (24T38), to be presented by Profs. **K. J. Trigger** and **B. T. Chao,** Department of Mechanical Engineering, University of Illinois. The causes, effects and means of reducing crater wear comprise this study which applies to both high-speed steel and carbide tools.

Of vital interest to all those associated with the engineering profession is the current shortage of engineering graduates which has far-reaching and sometimes surprising effects throughout the profession and industry. For one thing, it has greatly accelerated training and development programs in industry. **T. C. Gleason,** assistant chief engineer of Chrysler Corp. Laboratories, has prepared a searching appraisal of this much-publicized topic. His theme is: "Industry Looks at the Engineering Shortage" (24T41). In this meeting, he will offer some unusual comments and thought-provoking

*(Continued)*

RICHARD C. GIVENS, associated with the Technical Service Division of The Texas Co., joined the company in 1941 to engage in research and development work on cutting fluids in the Grease Research Department. He received his present assignment in 1954 and is currently a senior project chemist. A graduate of Southwestern Louisiana Institute, he holds a M.S. degree in chemistry from the University of Texas.

DR. R. K. GOULD, a graduate of Duke University, has been associated in the fields of petroleum processing and industrial lubrication at The Texas Co. since 1941. At present he is engaged in technical service activities on industrial lubricants and serves as editor of the company's monthly magazine, *Lubrication*. He was recently named editor of the ASLE journal, *Lubrication Engineering*.

Givens

Gould

Good

Cunningham

Boston

Favre

CHARLES H. GOOD, member of several technical societies, is a graduate of the University of Michigan with a B. S. degree in industrial-mechanical engineering and an M. A. in business administration. Formerly an application engineer with Carboloy Department of General Electric Co., he is now production engineer with Micrometrical Mfg. Co.

J. B. CUNNINGHAM, with a total of eleven years in the field of special and automatic machine design, is manufacturing specialist for General Dynamics Corporation's Convair Division. His job record includes: chief engineer for Wilson Automation Co. in Detroit; automation project engineer for the Ford Motor Co.; and manufacturing engineer for Westinghouse Electric Co.

ORLAN W. BOSTON, professor of mechanical and production engineering and chairman of the Department of Production Engineering, University of Michigan, received both his Bachelor's and Master's degrees in mechanical engineering at that university. Instrumental in setting up a complete production engineering curriculum at U. of M., he is author of several books and more than 200 articles on machine tools, cutting fluids and metal cutting.

ALBERT E. FAVRE, who holds degree in mechanical engineering from New York University, is chief production engineer for Aluminum Co. of America's forging operations in Cleveland. Author of many papers on forging design, Mr. Favre's work with aluminum forging has included the conversion of hammer dies to press dies, holder designs for large presses, successful experiments with no-draft forgings, and establishment of tooling standards for die engineering.

Matulaitis

Custers

V. E. MATULAITIS, director of research for Elox Corp. of Michigan, holds mechanical and aeronautical engineering degrees from University of Michigan and received his M. A. from Chrysler Institute of Engineering through the auspices of the university. Before his present assignment, he served as an engineering consultant, was chief engineer for Eaton Mfg. Co. Heater Div., and was associated with Fasco Corp. as an automotive engineer.

DR. JAN F. H. CUSTERS emigrated from The Netherlands to South Africa in 1947 to join the staff of the newly built Diamond Research Laboratory as senior research physicist. He had previously been a research physicist with the Philips Glowlamp Co. Author of more than 40 published articles, Dr. Custers was appointed to his present position of director of research at Diamond Research Laboratory in 1954. He is a member of the Chemical, Metallurgical and Mining Society of South Africa and The Netherlands Physics Society.

suggestions from the viewpoint of the engineering administrator. The breadth of his approach is indicated by the scope of his plan, which would affect everyone in the profession, from technicians and recent graduates through retired engineers, as well as college teachers, vocational counselors and experienced practicing engineers.

The National Standards Committee outlines their new proposed standard on carbide tool bits and their thinking on the subject in a paper (24T46) "ASTE-Recommended Carbide Tool Tip Standards" to be offered by **W. H. Seacord,** supervisor of manufacturing standards research, International Harvester Co. Users of carbide tools and carbide blanks will welcome this report on this important subject since, in addition to the vital cost factor, there are many other compelling reasons for standardization of carbide tools in industry.

The subject of standards is also carried over into the area of diamond tooling where some thoughts on standards for diamond tools are to be set forth in a paper (24T50) "Suggested Standards for Diamond Tool Shanks" by **Martin Hoerer,** vice president, Golconda Corp. Some of the advantages resulting from standardization of diamond tool shanks and the need for it are to be taken up. The present status of standardization efforts will also be covered.

In recent years, soluble oils have emerged from the field of more or less specialty formulations to occupy a place of prominence in the field of cutting fluids. "Soluble Oils and the Tool Engineer" (24T51) is the title of a paper by **Dr. R. K. Gould** and **R. C. Givens** of the Technical Service Div., Research and Technical Dept., The Texas Co. This will present the general picture on soluble oils, including their manufacture, handling and storage, the preparation of emulsions and particularly the factors that affect their performance. The paper will bring about the better understanding of cutting fluids and their proper application.

Surface finish, representing a different type of tolerance, was first measured by eye and by fingernail. **C. H. Good,** in his paper "A Survey of Surface Finish Inspection Techniques," (24T32) lists various methods of inspection that have since been put into use. The author describes the application and limitation of various inspection methods and types of equipment.

As electronics will play an important part in automatic production, so is automatic production playing an important part in electronics. **J. B. Cunningham,** manufacturing specialist, Convair Division of General Dynamics Corp., will present a paper on "Automated Electronics," (24T35) in which he will report on automatic production of electronic components. In covering the techniques and limitations of automatic production in this field, Mr. Cunningham outlines the production of a typical circuit board and the assembling of its components.

As tool engineering has become a separate branch of engineering, so must tool engineering education become a separate branch of engineering education. It is based on rigorous engineering theories, but to different ends, as indicated in the paper "The Training and Development of Tool Engineers," (24T40) by **O. W. Boston,** professor of mechanical and production engineering, University of Michigan. This paper relates in detail the processes by which the University of Michigan set up a production engineering program, one that is pioneering in training future tool engineers.

That new design ideas lead to new production techniques, and that new production techniques lead to new designs is illustrated in "Tooling Problems for Utilization of Large Hydraulic Presses" (24-T43) by **A. E. Favre,** chief production engineer for Aluminum Co. of America's forging operations.

Spiers

Robbins

Daasch

Gates

J. B. SPIERS, chief engineer for American Coldset Corp., was born and educated in Glasgow, Scotland, where he received a diploma in marine engineering. Before coming to America in 1949, he served as chief plant engineer at Harland & Wolff. His engineering experience here includes work with George Anderson & Co., Algoma Steel Corp. and Modern Tool Works. He became associated with American Coldset in 1951 as a consultant and five months later was named chief engineer.

PAUL H. ROBBINS, executive director of the National Society of Professional Engineers, is a registered engineer and holds degrees from Syracuse University and MIT. His broad engineering experience includes work as: director of training for the New York Port of Embarkation, under the Chief of Transportation of the Army; Expert Examiner in Engineering Work for the city of New York; and consultant on engineering training for the mayor of New York.

FRANCIS J. DAASCH, chief machinability engineer, Rock Island Arsenal Laboratory, is a mechanical engineering graduate of Iowa State College and received his M.S. from University of Minnesota. Author of many scientific articles, Mr. Daasch's more than 20 years of experience includes work as chief engineer for Midwestern Geophysical Laboratory; mechanical engineer for Gulf Oil Corp. and chairman of the engineering department at University of Houston.

T. S. GATES has been chief engineer for National Broach & Machine Co. for the past 15 years. Upon joining the company in 1939 as a design engineer, he helped design gear shaving, lapping and grinding machines, as well as gear checking equipment, gear shaving cutters and broaches. Previously he was with Ferro Stamping Co., rising to the position of planning and production manager. Author of many technical papers, he was born and educated in Canada where he received his shop training.

Demands for fewer mechanical joints in air-frame fabrication have led to the construction of large hydraulic presses. Since piece part design requirements are different, tooling for the new presses is more than a simple extension of the experience already gained with smaller presses. The heavy press program is opening up new areas in both design and production.

One of the puzzling aspects of industrial diamond technology, that is, how to make an intelligent choice for many special uses, will be clarified in a session on "The Selection of Diamonds for Various Applications" (24T28) by **Dr. G. P. Freeman** of D. Drukker and Zn. N.V. His recommendations will take into consideration the many factors, both technical and nontechnical, affecting the choice of a diamond for a particular application. Among nontechnical factors is the very vital one of cost. Some suggestions will be given on how to get the most out of industrial diamonds.

With the exception of wheel dressers, which are used solely to rue or clean plain grinding wheels, most other types of diamond-tipped tools require the diamond to be shaped for use. This is a measure of the importance of "The Selection, Division and Shaping of Diamonds for the Manufacture of Diamond Tipped Tools" (24T9). The speaker will be **R. G. Weavind,** director of research of the Diamond Research Laboratory. Factors of significance in such uses include cost considerations, methods of dividing stones to best advantage, shaping of the diamonds and equipment to be utilized. Numerous illustrations will be employed to exemplify these points.

HARRY M. ADAMS, automation specialist for Chrysler Corp., has had more than 40 years of wide engineering experience. Before his present position as chairman of Chrysler's automation committee, he was automation coordinator at the Dearborn Mfg. Division of Ford Motor Co. where he was instrumental in 54 automation developments. Earlier he was project manager for a contract with the National Bureau of Standards to design and build a group of fully automatic machines which were to produce parts for what is known now as "Operation Tinkertoy."

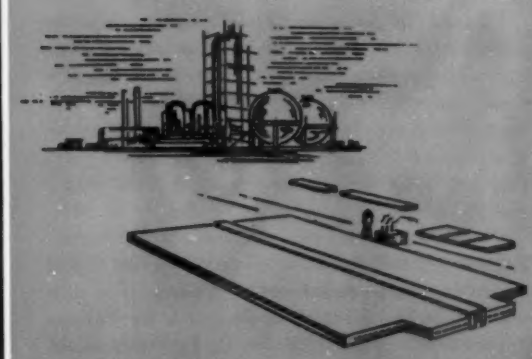
A. L. THOMSON is a member of the physics research department, Chrysler Research Laboratories, Chrysler Corp., specializing in surface physics. He joined Chrysler in 1953 after receiving a degree of Master of Automotive Engineering from Chrysler Institute of Engineering. Mr. Thomson holds his bachelor of science degree from Wayne University.

Adams

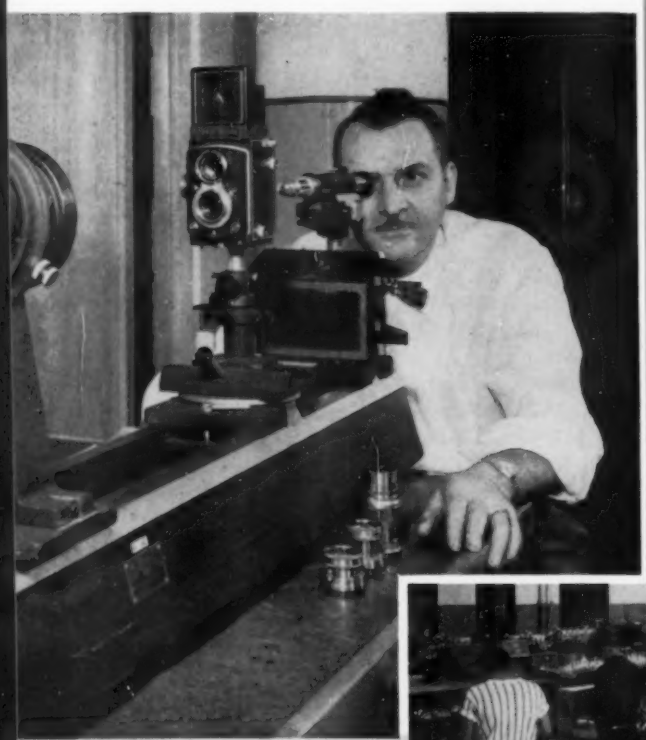
Thomson

Appealing to a wide range of interests, the industrial tour schedule arranged by the Chicago Host Committee for convention week visitors, features 12 plant inspection visits for viewing "engineering in action." The registration desk for plant tours will be located at the International Ampitheatre, site of the exposition. All morning tours originate from the Conrad Hilton Hotel with bus departure time fixed at 8:30 a.m. while all afternoon tours start at the International Ampitheatre with buses leaving at 1:15 p.m. Each visitor must confirm his reservation at the departure point for a specific tour within the hour before buses leave.

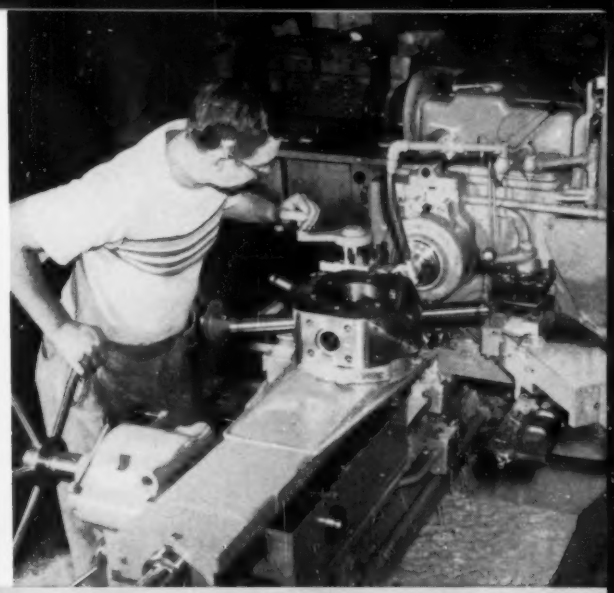
# plant tours



A tour of the Merchandising, Testing and Development Laboratories of Sears, Roebuck & Co. is scheduled for Thursday afternoon. This is a view of operations involved in testing a camera lens.



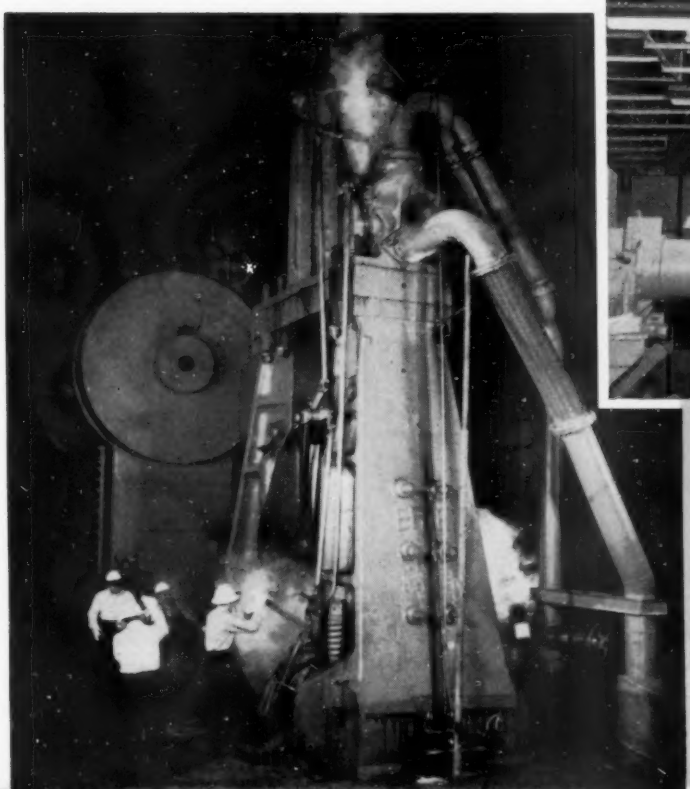
Skil Corp., maker of Skil Saws and other portable electric and pneumatic tools is on the ASTE plant tour agenda for Tuesday afternoon. Pictured here is the final assembly area.



The above close-up view shows a typical turret lathe operation as carried out by Scully-Jones & Co., object of ASTE plant tours Wednesday morning and afternoon.

Convention-goers who visit Armour Research Foundation of Illinois Institute of Technology, might see a scene similar to this where a special alloy steel is being poured into a cast-iron mold in Armour's foundry. A morning and an afternoon tour are scheduled for Tuesday.

Hotpoint Co.'s new plant producing a refrigerator every 20 seconds will host ASTE on Wednesday afternoon. Here, a small segment of the more than 9 miles of overhead lines is shown.

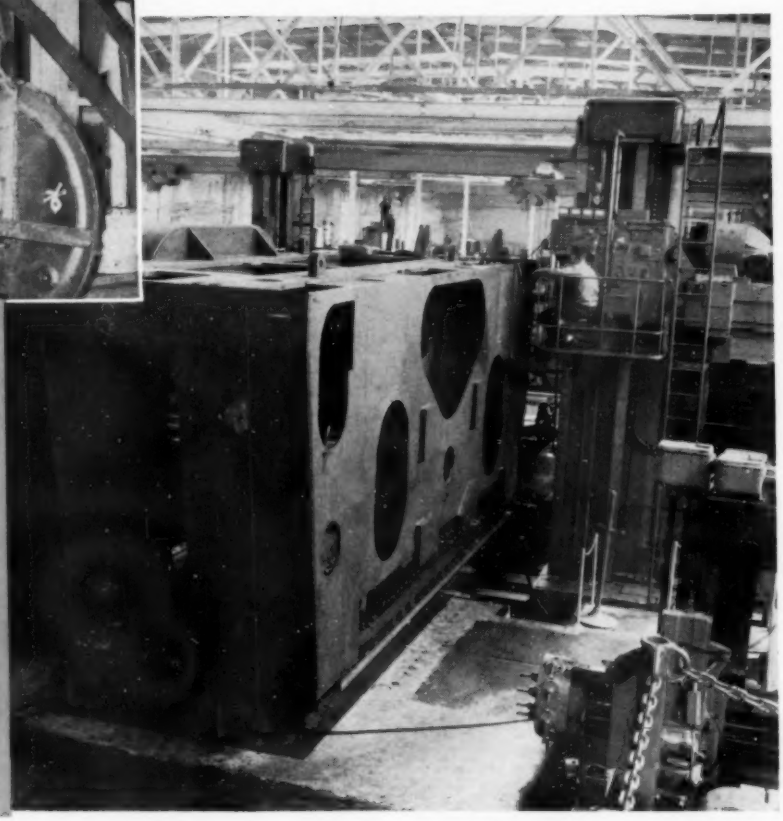


One of the world's largest 50,000 lb drop hammers may be seen Thursday morning by visitors to Kropp Forge Co. The drop hammer is shown in the process of making precision scale-free forgings.

# plant tours

Wednesday morning provides an opportunity to view operations at Ford Motor Co.'s Aircraft Engine Division. Above, the J-57 Turbojet engine, officially rated in the 10,000-pound thrust class, is being moved on its special carrying cradle to a test cell for qualification.

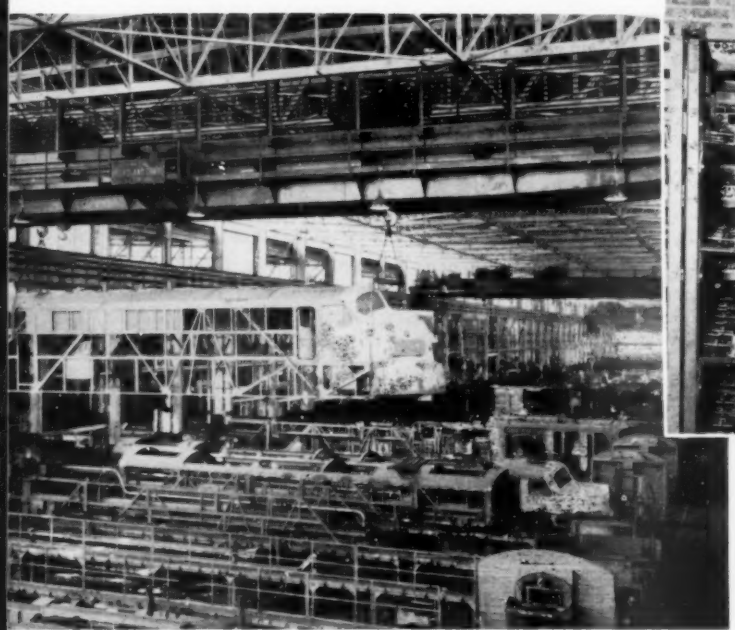
Those who tour International Harvester Co.'s Melrose Park Works on Thursday afternoon, can view the manufacture of six different sizes of Diesel engines ranging from 52 to 200 hp. The photograph shows performance of the finishing weld on the final drive housing for one of the company's tractors.



Typical of what tool engineers can see on their Friday morning tour of Verson Allsteel Press Corp. is this photograph of a large boring setup. They will also view burning, welding, milling, planing, and gear-cutting operations required to produce 60 to 28,000-ton presses.

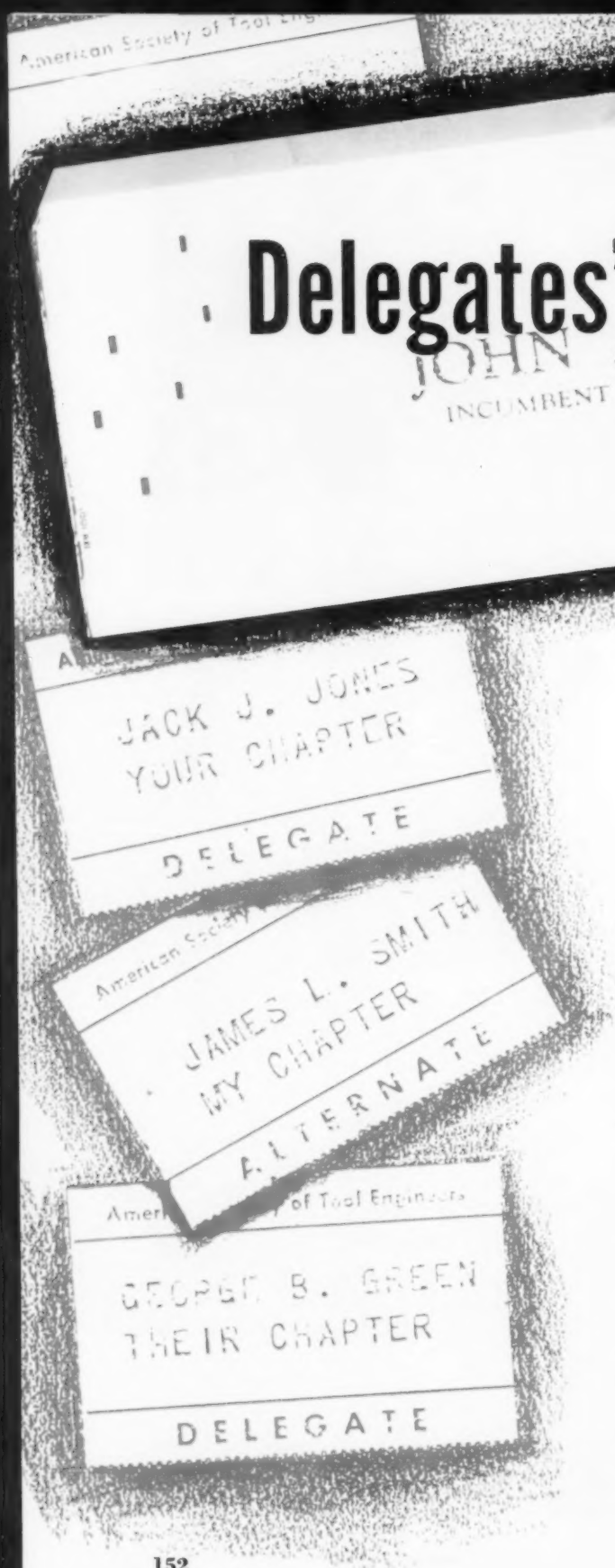
Producers of nearly 5½ million net tons of steel annually, the South Works of United States Steel Corp. will be host to ASTE'rs on Tuesday morning. At right is a picture of the plant's twin blast furnaces.

Monday afternoon a tour of Motorola, Inc., is scheduled for ASTE convention-goers. Pictured at the right, one stage in the production of a TV set, involves the complete TV chassis arriving at Franklin Park plant where it is put on a hook conveyor which takes it to the manufacturing area.



Electro-Motive Division of General Motors Corp. at La Grange will open its doors to ASTE conventioners Thursday afternoon. Shown at left is a locomotive car body being taken to the next position for trucking.

# Delegates' Agenda




Playing an ever-increasing key role in Society activities, ASTE's National Delegates will convene all day Thursday, March 22, at the Palmer House during convention week.

Representing each ASTE chapter, 130 National Delegates will meet to elect the men who will serve on the Society's National Board of Directors for the 1956-57 term, and to find means of getting further recognition for the profession of tool engineering.

Since the National Delegates' Plan was drawn up by national ASTE officers in January of 1954, Delegates have been functioning as the all-important liaison between national and chapter levels. Serving as a two-way avenue of communication, they have kept each level informed of the other's activities and needs, and have brought about a closer knit and more democratic Society.

### Society Pays Transportation

To insure that each and every chapter will be represented at the 1956 meeting in Chicago, the Society is again footing the transportation bills for National Delegates. Each will be reimbursed for first-class, round-trip railroad fare, including a pullman lower berth or parlor car seat. Chapters need pay only for hotel accommodations, meals and incidental expenses of the Delegate.

February elections will determine who will represent the chapters at the meeting. Chapter chairmen are urged to send in the delegates' authorization slips, naming the newly elected Delegate and Alternate, to national headquarters well before the March meeting. Copies should also go to the Delegate and Alternate, and one should be earmarked for the chapter files.

No proxies will be accepted at the House of Delegates, unless submitted through national headquarters, and it will be necessary to indicate which Delegate is appointed by the chapter as its proxy.

### National Delegates' Conference

Thursday, following the President's Breakfast for National Delegates at 8:30 am. in the Red Lacquer Room, the group will adjourn to the Grand Ballroom for the National Delegates' Conference.

To be presided over by National President Harry B. Osborn, Jr., the conference will concern itself as a study session with the problems of acquainting industry and education with the purpose, aims and functions of the American Society of Tool Engineers, particularly at the chapter level.

Prior to the meeting, National Delegates are asked to obtain the thinking of their own chapters on this matter so that they can discuss the problem intelligently.

"It is hoped that the findings of this study session, particularly in the light of the experience that will be assembled there, can have far-reaching effects upon the national and chapter programs of ASTE in acquainting industry and education with its objective and purpose," President Osborn said.

### House of Delegates

At noon, the House of Delegates' Luncheon will hold forth in the Grand Ballroom, and at 1 p.m., the 24th annual meeting of the House of Delegates will convene in closed session. Only duly authorized representatives of the chapters will be admitted.

Main business at hand will be the election of the 14 members of the National Board of Directors from the list of candidates. Nominees will be discussed and ballots will be run off quickly with aid of IBM machines.

Elected directors will take office at the semi-annual meeting next October and serve for the ensuing year.

Delegates will also bring forth recommendations to the Board of Directors as per instructions of their chapters for discussion and action.

**Headquarters for the National Delegates and center for all their activities will be the Palmer House, located at 15 East Monroe St. in Chicago.**

## Calendar for March 22

- **8:30 a.m.—President's Breakfast for National Delegates, Red Lacquer Room, Palmer House**
- **9:15 a.m.—National Delegates' Conference, Grand Ballroom, Palmer House**
- **12 noon—House of Delegates' Luncheon, Grand Ballroom, Palmer House**
- **1:00 p.m.—House of Delegates' Meeting, Grand Ballrooom, Palmer House (closed session)**

Delegates are cordially invited and urged to watch the ASTE Board of Directors in action the previous Saturday and Sunday, March 17 and 18. The Board will meet from 9 a.m. to 5 p.m. on Saturday and from 9 a.m. until adjournment on Sunday. The meeting is open to anyone who is interested.

Delegates who have any operational chapter problems can find possible solutions by visiting the national headquarters room in the Conrad Hilton.

# MONDAY

# MARCH 19

## New Materials Day

### Conferences

*1:30 p.m., Room A, Amphitheatre*

**Ceramic Cutting Tools**

"Ceramic Tooling Brought Up-to-Date" (24T1). W. B. Kennedy, Chief, Experimental Machining Branch, Rodman Laboratory, Watertown Arsenal.

"Cemented Borides for Tool Materials" (Research Report 2). A. G. Metcalfe, Senior Metallurgist, Armour Research Foundation.

Chairman—Wm. Cleary, Jr., Shop Supervisor, Caterpillar Tractor Co.

*2:30 p.m., Room B, Amphitheatre*

**Working the "Wonder" Materials**

"The Drawing of Titanium" (24T2). J. S. Kirkpatrick, Vice President, Brooks & Perkins, Inc.

"Machining with Silent Sound" (24T3). Jack Welch, Manager, Machine Tool Division, The Sheffield Corp.

Chairman—Wm. G. Bylsma, Tool and Die Supervisor, Steel Case, Inc.

### Plant Inspection Visit

Motorola, Inc. 1:15

# Program

*3:30 p.m., Room C, Amphitheatre*

**What's New in Grinding**

"Recent Advances in Grinding Wheels" (24T4). Carl Soderlund, Sales Engineer, Norton Co.

"Precision Production Grinding Machines" (24T5) A. H. Dall, Director of Standard Machine Tool Engineering, The Cincinnati Milling Machine Co.

"Electrical Discharge Grinding of Tools" (24T6). V. E. Matulaitis, Director of Research, Elox Corp. of Michigan.

Chairman—E. Ted Neubauer, Senior Development Engineer, Trane Co.

*6:30 p.m., Commons Bldg., Illinois Institute of Technology*

**Shaped Diamond Tool Symposium**

Dinner and address on "Man-Made Diamonds" (24T7). Speaker—J. S. Gillespie, Manager, Diamond Project, Carboloy Department of General Electric Co.

Master of Ceremonies—Dr. J. T. Rettaliata, President, Illinois Institute of Technology.

# TUESDAY

# MARCH 20

## Research Day

### Conferences

*9:30 a.m., Room A, Amphitheatre*

**Shaped Diamond Tool Symposium**

"Crystallography and Grinding Hardness of the Diamond Crystal" (24T8). Dr. J. F. H. Custers, Director of Research, Diamond Research Laboratory.

"The Selection, Division and Shaping of Diamonds for Diamond Tipped Tools" (24T9). R. G. Weavind, Director of Research, Diamond Research Laboratory.

"Some Aspects of the Batch Production of Diamond Tools" (24T10). N. R. Smith, Director, L. M. Van Moppes and Sons, Ltd.

Chairman—Dr. Leonid V. Azaroff, Research Physicist, Armour Research Foundation.

*9:30 a.m., Room B, Amphitheatre*

**Automating the Individual Machine**

"The Tool Engineer's Function in Numerical Control" (24T11). Jesse Daugherty, Vice President—Engineering, Giddings & Lewis Machine Tool Co.

"The Use of Punched Cards for Machine Control" (24T12). J. J. Jaeger, Vice President and Chief Engineer, Machinery Div., Pratt & Whitney Co., Inc.

Chairman—Maurice J. Ullman, Chief Tool Engineer, Swan Engineering & Machine Co.

*10:30 a.m., Room C, Amphitheatre*

**Machine Tool Economics—Rent or Buy?**

"The Case for Buying Machine Tools" (24T13) George Terborgh, Research Director, Machinery & Allied Products Institute.

"Economics of Replacing Machine Tools by Equipment Rental" (24T-14). F. J. Trecker, President, Kearney & Trecker Corp.

Chairman—Carl A. Darger, Owner, C. A. Darger & Associates.

### Plant Inspection Visits

South Works
United States Steel Corp.—8:30 a.m.

Armour Research Foundation—
8:30 a.m., 1:15 p.m.

Skil Corp.—1:15 p.m.

*1:30 p.m., Room A, Amphitheatre*

**Shaped Diamond Tool Symposium**

"Diamond Dressing of Form Grinding Wheels" (24T15). Jack Bryant, Process Engineer, Allis-Chalmers Manufacturing Co.

"Shaped Tools for Form Grinding from the Manufacturers' Viewpoint" (24T16). J. B. Speirs, Chief Engineer, American Coldset Corp.

"Suggested Standards for Diamond Tool Shanks" (24T50). Martin Hoerer, Vice President, Golconda Corp.

*2:30 p.m., Room B, Amphitheatre*

**Plastic Tooling Challenges the Tool Engineer**

"Advantages of Plastic Tooling" (24TC1A). Fred Lyijynen, Supervisor, Plastic Development Dept., Auto Body Division, Chrysler Corp.

Chairman—Harry J. Moffatt, Superintendent of Tools & Supplies, Caterpillar Tractor Co.

Interview Panel Members—John Mickey, Manager, Research Department, Ford Motor Co.; Robert H. Voss, President, Warren Plastics & Engineering, Inc.; and E. R. Kalis, General Foreman, Fisher Body Division, General Motors Corp.

*3:30 p.m., Room C, Amphitheatre*

**Professional Engineering—How and Why**

"Why Register?" (24T17). Paul H. Robbins, Professional Engineer, Executive Director, National Society of Professional Engineers.

"How To Become a Registered Professional Engineer" (24T18). John D. Constance, Professional Engineer.

*8 p.m., Beverly Room, Conrad Hilton Hotel*

**Tool Engineering Research in Action**

"Methods of Applying Cutting Fluids" (Research Paper 3). M. C. Shaw and P. A. Smith, Professors, Machine Tool Laboratory, Massachusetts Institute of Technology.

"Metal-Cutting Evaluation" (24T-19). F. J. Daasch, Chief Machinability Engineer, Rock Island Arsenal Laboratory.

Chairman—Wallace E. Carroll, President, Simpson Electric Co.

*8:30 p.m., Waldorf Room, Conrad Hilton Hotel*

**Solving Carbide Die Problems**

"Machining Carbide Dies" (24C2). J. K. Carroll, Executive Vice President, Electrosize, Inc.

"How To Help the Die Builder Give You Satisfaction" (24C2). H. Harig, President, Harig Manufacturing Corp.

"What the Strip Steel Manufacturer Should Know" (24C2). Burton E. Longwell, Assistant Manager of Sales, Sheet & Strip Div., Republic Steel Corp.

"The Die Builder Asks for Help" (24C2). Donald E. Oberg, President and General Manager, Oberg Manufacturing Co., Inc.

"Application of Cemented Tungsten Carbide for Dies" (24C2). P. F. Rehner, Manager of Sales, Carmet Division, Allegheny Ludlum Steel Corp.

"The Stamper and Die Building" (24C2). Thomas C. Roberts, President, Kobzy Tool Co.

Chairman—Willis G. Ehrhardt, Managing Partner, Ehrhardt Tool & Machine Co.

# WEDNESDAY

# MARCH 21

## New Processes Day

### Conferences

*9:30 a.m., Room A, Amphitheatre*

**Shaped Diamond Tool Symposium**

"Use of Industrial Diamonds and Diamond Tools in Industry" (24T-20). D. J. Wallace, Vice President, Wheel Trueing Tool Co.

"The Use of Diamond Tools for Turning and Shaping of Small Parts" (24T21). L. A. Hurwitz and R. A. Kurtz, Hamilton Watch Co.

"Application of Diamond Tools to Turning, Boring and Reaming" (24T22). Joseph Klipper, Vice President and General Manager, Clipper Diamond Tool Co.

Chairman—Adam F. Gabriel, Acme Industrial Co.

*9:30 a.m., Room B, Amphitheatre*

**Economical Production of Fine Pitch Gears**

"An Objective Look at the Field of Instrument Gearing" (24T23). Louis D. Martin, Gear Consultant, Eastman Kodak Co.

"Gear Gaging Automation" (24T-24). T. S. Gates, Chief Engineer, National Broach & Machine Co.

Chairman—Fred C. Freund, Works Manager, Giddings & Lewis Machine Tool Co.

### Plant Inspection Visits

**Aircraft Engine Div.**
**Ford Motor Co.—8:30 a.m.**

**Scully-Jones & Co.—8:30 a.m. and 1:15 p.m.**

**Hotpoint Co.—1:15 p.m.**

*10:30 a.m., Room C, Amphitheatre*

**Electronic Calculators and the Tool Engineer**

"Introducing Computers for Machine Tool Control" (24T25). J. J. Stone, Assistant Chief, Electrical Engineering Div., Battelle Memorial Institute.

"The Machinability Computer" (24-T26). Dr. W. W. Gilbert, Consultant, Machinability Development Service, General Electric Co.; and E. J. Weller, Carboloy Dept., General Electric Co.

Chairman—John R. Baker, Master Mechanic, Norge Div., Borg Warner Corp.

*1:30 p.m., Room A, Amphitheatre*

**Shaped Diamond Tool Symposium**

"Cemented Particle Diamond Tools" (24T27). C. Law McCabe, Metals Research Laboratory, Carnegie Institute of Technology.

"The Selection of Diamonds for Various Applications" (24T28). Dr. G. P. Freeman, D. Drukker and Zn. N. V.

Chairman—S. E. Rusinoff, Department of Mechanical Engineering, Illinois Institute of Technology.

*2:30 p.m., Room B, Amphitheatre*

**Automation and Tolerances Affect Jig and Fixture Design**

"Impact of High Accuracy Requirements on Jigs and Fixtures in Mass Production" (24T30). A. V. Bodine, President, The Bodine Corp.

"Automation—Its Effect on Jigs and Fixtures" (24T31). H. M. Adams, Automation Specialist, Chrysler Corp.

Chairman—R. M. Knabe, Master Mechanic, J. I. Case Co.

*3:30 p.m., Room C, Amphitheatre*

**The What and How of Surface Finish**

"A Survey of Surface Finish Inspection Techniques" (24T32). C. H. Good, Production Engineer, Micrometrical Manufacturing Co.

"Surface Finish and the Production Engineer" (24T33). Dr. C. R. Lewis and A. L. Thomson, Chrysler Corp.

*8 p.m., Room A, Amphitheatre*

**Automation—You Can Afford It!**

"Automation for the Big Production Shop" (24T34). Ralph E. Cross, Executive Vice President, The Cross Co.

"Automated Electronics" (24T35). J. B. Cunningham, Manufacturing Specialist, Convair Div., General Dynamics Corp.

Chairman—Mel Burdett, Machine & Tool Buyer, Caterpillar Tractor Co.

# THURSDAY

# MARCH 22

## Management Day

### Conferences

*9:30 a.m., Room B, Amphitheatre*

**Fluid Power Today**

"To Be Announced" (24T36)
"To Be Announced" (24T37)
Chairman—Representative of the National Fluid Power Association.

*10:30 a.m., Room C, Amphitheatre*

**Metal-Cutting Research Applied**

"Crater Wear of Cutting Tools" (24T38). Prof. K. J. Trigger and Prof. B. T. Chao, Department of Mechanical Engineering, University of Illinois.

"Some Applications of Research Findings to Shop Problems" (24T-39). L. V. Colwell, Department of Production Engineering, University of Michigan.

Chairman—Carl J. Oxford, Jr., Research Engineer, National Twist Drill & Tool Co.

*1:30 p.m., Room A, Amphitheatre*

**Training and Development of Tool Engineers**

"The Training and Development of Tool Engineers" (24T40). Prof. O. W. Boston, Head, Department of Production Engineering, University of Michigan.

"Industry Looks at the Engineering Shortage" (24T41). T. C. Gleason, Assistant Chief Engineer, Chrysler Corp. Laboratories.

Chairman—Prof. O. D. Lascoe, Department of Industrial Engineering, Purdue University.

*3:30 p.m., Room B, Amphitheatre*

**Cost Reduction through Product and Tool Maintenance Analysis**

"Product Changes Improve Manufacturability" (24T42). L. D. Miles, General Electric Co.

"Control of Tool Costs Lowers Production Costs" (24T43). E. Griffiths, Director of Expense Control, Headquarters Manufacturing Div., Westinghouse Electric Corp.

Chairman—Fred R. Swanson, Chief of Commercial Engineering, Sundstrand Machine Tool Co.

*7 p.m., Grand Ballroom, Conrad Hilton Hotel*

**24th Annual Banquet of the American Society of Tool Engineers**

Speaker—David Swan, Director of Research, Electro Metallurgical Co., Division of Union Carbide and Carbon Corp.

## Plant Inspection Visits

**Kropp Forge Co.—8:30 a.m.**

**Melrose Park Works, International Harvester Co.—1:15 p.m.**

**Electromotive Div. General Motors Corp.—1:15 p.m.**

**Merchandising, Testing and Development Labs, Sears, Roebuck & Co.—1:15 p.m.**

# FRIDAY MARCH 23

## Tool Engineering Day

### Conferences

*9:30 a.m., Room A, Amphitheatre*

**Designing for Tomorrow's Competition**

"Measuring Productivity in Tool Design" (24T44). Prof. A. F. Gould, Head, Department of Industrial Engineering, Lehigh University.

"Planning for Tomorrow's Gaging" (24T45). Lewis O. Heinold, Manager, Automatic Control Engineering Dept., Federal Products Corp.

Chairman—Paul F. Dirksen, Mechanical Engineer, Weaver Manufacturing Co.

*10:30 a.m., Room B, Amphitheatre*

**Standards and the Tool Engineer**

"ASTE-Recommended Carbide Tool Tip Standards" (24T46). W. H. Seacord, Supervisor of Manufacturing Standards Research, Manufacturing Research Dept., International Harvester Co.

"The Need for Tool Steel Standards" (24T47). Dr. G. A. Roberts, Vice President—Technology, Vanadium Alloys Steel Co.

Chairman—Cyril Ainsworth, Technical Director, American Standards Association.

### Plant Inspection Visit

Verson Allsteel Press Corp.—8:30 a.m.

# Program

*1:30 p.m., Room C, Amphitheatre*

### Tooling the World's Largest Presses

"Tooling Problems for Utilization of Large Hydraulic Presses" (24T48). A. E. Favre, Chief Production Engineer, Cleveland Forge Plant, Aluminum Company of America.

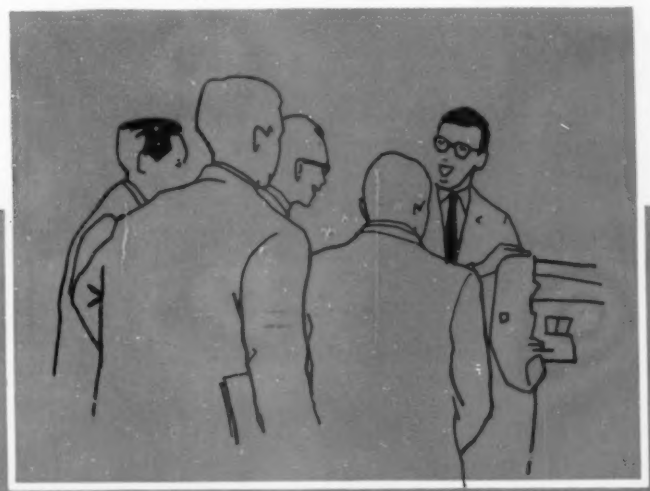
"Tool Problems Peculiar to the Heavy Press Extrusion Industry" (24T49). H. J. Ross, Production Manager, Heavy Press Extrusion Plant, Kaiser Aluminum & Chemical Corp.

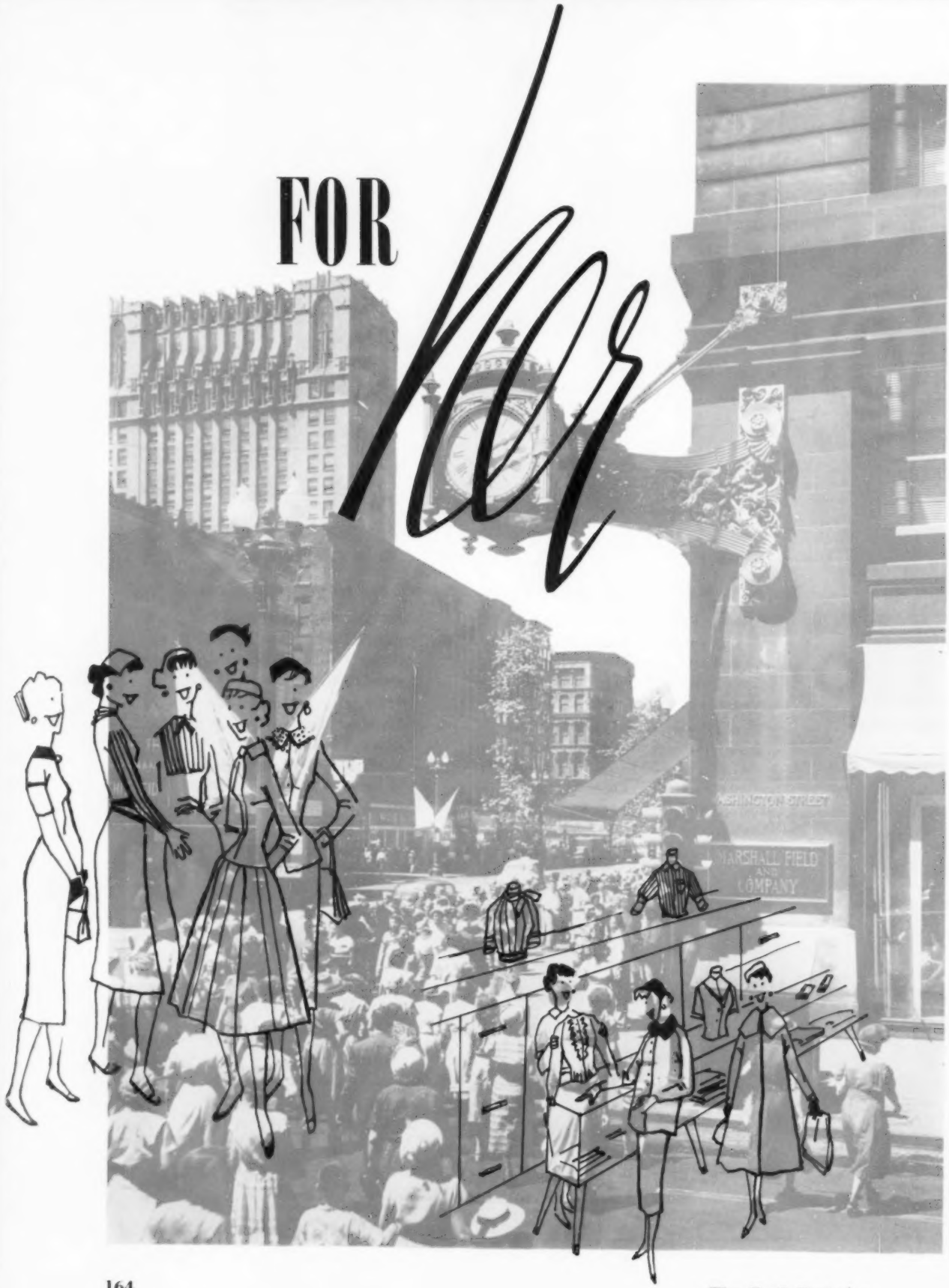
*2:30 p.m., Room A, Amphitheatre*

### Lubrication for the Tool Engineer

"Soluble Oils and the Tool Engineer" (24T51). R. K. Gould and R. C. Givens, Technical Service Div., Research and Technical Dept., The Texas Co.

"Role of Cutting Fluids in Machinery Operation" (24T52). Dr. M. E. Merchant, Assistant Director of Research, Cincinnati Milling Machine Co.




FOR
MARSHALL FIELD
AND
COMPANY

A busy and entertaining week is in store for ASTE wives who accompany their husbands to Chicago, March 19-23, for the Society's 1956 convention.

Specially geared for feminine tastes, the program, planned by Mrs. Richard C. Berliner and her committee, will feature luncheons, tours of local industries, a tea and a fashion show.

Since many of the tours and events are limited in the number of ladies that can be accommodated, wives are urged to fill in and mail the advance reservation blank in the Activities Program which is being mailed to every member of the Society. In addition, all tours and events must be confirmed upon arrival in Chicago at the Ladies' Activities desks in the Conrad Hilton and the Palmer House.

The program leaves ample time for some leisurely shopping in the nearby downtown area of Chicago, one of the midwest's foremost fashion centers.

Starting off the week's activities on Monday, March 19, Mrs. Berliner and her committee will be hostesses at a get-acquainted tea in the Conrad Hilton's Ladies' ASTE Lounge or private dining room No. 3. Hours are from 2-4 p.m.

With the exception of Wednesday, the ASTE Ladies' Lounge in the Conrad Hilton will be the meeting place for all tours. A refuge to sit down and rest tired feet, the Lounge will also provide cards and tables for bridge enthusiasts.

For music lovers, Tuesday offers luncheon at the renowned Kungsholm Scandinavian Restaurant, followed by a performance of the entertaining Kungsholm puppets in miniature grand opera. Scheduled departure is by chartered bus at 11:30 a.m. from the Conrad Hilton Hotel. The event is limited to 70. Costs include $3.55 for the luncheon plus transportation.

An alternate tour on Tuesday will give the women a firsthand view of how cosmetics are made, with a visit to Helene Curtis Industries. Also the newest and latest trends in hair styles will be shown. The bus leaves the Conrad Hilton at 12:30 p.m. The only cost is $1.50 for transportation and the tour is limited to 50.

A fashion show and luncheon in the Wedgewood Room, on the 7th floor at Marshall Field & Co., is scheduled for 11:30 a.m., Wednesday. There will be no bus chartered. Instead, the ladies can walk one block west of the Conrad Hilton, take a northbound bus No. 4, No. 6 or No. 38, and get off at Randolph. Bus fare is 20 cents and cost of the luncheon is $2.40. No more than 225 can attend the affair.

Thursday promises to be a full day with the chartered bus leaving the Conrad Hilton at 9 a.m. for a trip to the Croydon China Co., luncheon at nationally known Mickelberry's Log Cabin, and an afternoon tour of Italian Swiss Bottling Co. for a view of wine-making.

At Croydon, the group will watch the manufacture of dishes and china and view proper table settings. Thursday costs are $2.65 for the luncheon plus transportation. Limit is 50 women.

Thursday evening the gals will join their husbands for the Annual ASTE Banquet in the Grand Ballroom of the Conrad Hilton at 7 p.m. Informal attire is in order.

A trip through Standard Oil Refinery at Whiting, Ind. on Friday, winds up the planned activities. Meeting in the Ladies' Lounge, the women will board the South Shore train at 9 a.m. Viewing the manufacture of oil and gasoline, the ladies will also be Standard Oil Co.'s guests for lunch. Sensible and comfortable shoes are advised for utmost enjoyment of the tour. The only cost, $1.69, is for train fare. A limit of 50 is imposed on the tour of Standard's operations.

**Some of the committee members who have planned the program for ASTE wives are, seated from left, Mrs. Lamont Keith; Mrs. Richard C. Berliner, chairman; Mrs. Walter W. Haskins; and Mrs. B. A. Fleury, Jr. Standing are Mesdames Edward S. Wendt, Eugene N. Darrow, Clark Shafer, Robert Jameson and E. W. Ostrom.**

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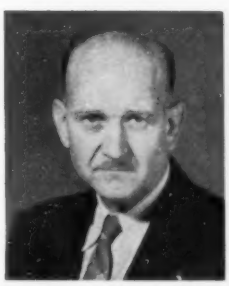

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# ASTE INDUSTRIAL EXPOSITION

## CHICAGO—march 19 thru 23

## EXPOSITION INDEX SECTION


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# DEVELOPMENTS IN TOOLING

By Robert A. Wason and Arthur Colton
Associate Editor Assistant Editor

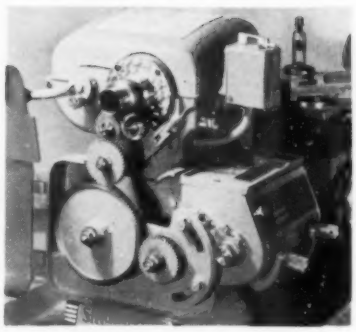
Theme for the ASTE Industrial Exposition to be held in Chicago this month is "Tooling for Tomorrow." Visitors to the exposition will obtain ideas and information that will help them to prepare plans for tomorrow's production with tomorrow's tools. For those who want to plan their itineraries and for those who cannot attend the exposition, the following section will review significant products to be shown. Since the tooling for tomorrow will be based on the developments of the past few years, only recently developed equipment and processes will be described. Some equipment described will not be at the show because of sizes involved.

If additional information is desired on any of the products mentioned, it is suggested that the manufacturer be contacted directly. Names and addresses for the manufacturers will be found in the Directory, which follows immediately after this section.

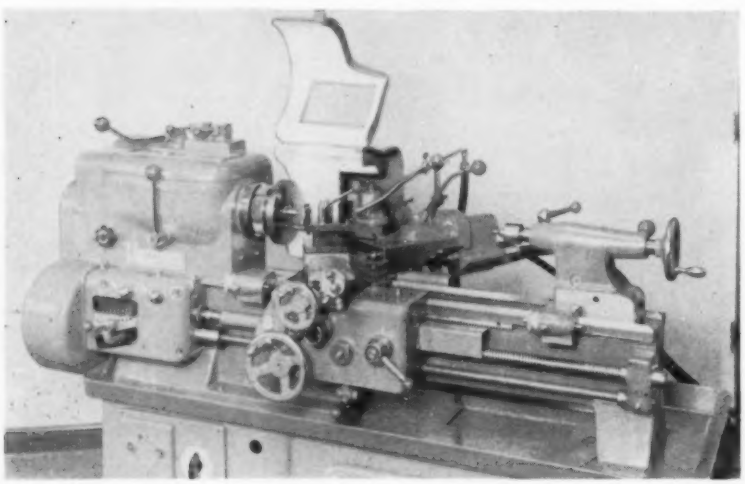
## Turning Machines

One of the most significant trends in the design of lathes over the past two years has been the emphasis on operator convenience. Advances include large micrometer dials, easier shifting of spindle speeds, more spindle speeds and higher top speeds. A heavier pedestal for a more rigid foundation and the use of malleable iron for certain castings where high tensile strength and elasticity are required feature the new lathes by Sheldon Machine Co., Inc. These lathes also have a variable speed drive giving an infinite number of speeds between 50 and 1800 rpm. They can be used in the toolroom or as a production machine for small lots. Although Micarta is more expensive, micarta gears have replaced steel in the end train to reduce noise. Hardened bedways result in longer life.

For increased job versatility, it is now possible to use more accessories on the Sheldon lathes. A variety of spindle noses has been made available, including long taper key drives. More air operated devices, such as air chucks, air collet attachments and others can now be applied to speed up turning operations. Also, two-speed motors, controls and other electrical equipment are adding to versatility.



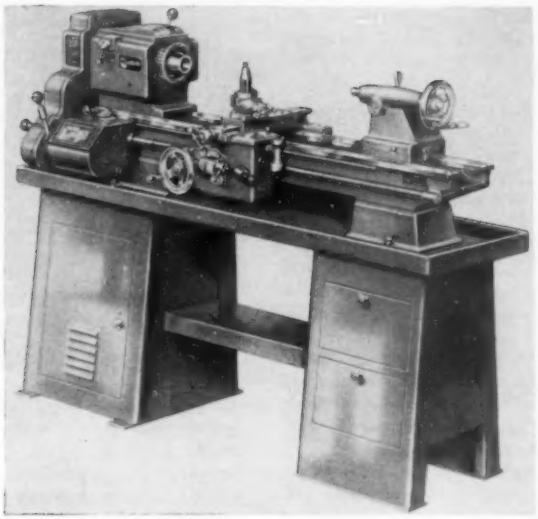
**Micarta gears have replaced steel in the end train of a Sheldon lathe to reduce noise.**



**Harrison hydraulic copying lathe works from master templates.**

Speed lathes shown by Schauer Mfg. Corp. are built for ease of operation, even the housing faces the operator at an angle. The machine rotates the holding mechanism at a high speed for a predetermined number of revolutions and will then reduce speed for the remainder of the cycle. When the cycle is complete, the machine stops and, after a safe delay, automatically opens the work holder.

A Weiler 1-inch bar capacity hand turret lathe, shown by Eric R. Bachmann Co., Inc., features a 2-speed reversible motor. The machine has 16 spindle speeds and is driven by a V-belt between two antifriction bearings in the headstock. A single lever starts and stops the spindle, opens and closes the collet and applies a spindle



**The Clausing 6300 lathe has 1-inch collet capacity; enclosed headstock, apron and quick-change gear box, all with oil-bath lubrication, and outboard, underneath drive with dual A-belts driving the spindle.**

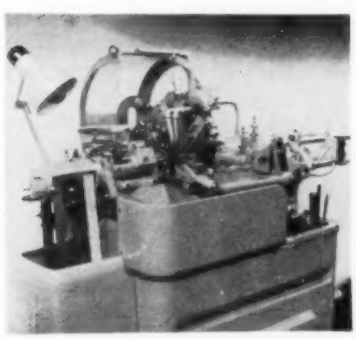
brake. It is possible to have the machine run continuously while opening and closing the collet.

The 6300 series Clausing 12-inch lathe has a forged spindle with hardened, tapered key-lock nose. The spindle is mounted on tapered roller bearings in this machine built by Clausing Div., Atlas Press Co. The tailstock has a No. 3MT ram with tang socket for bigger tool capacity. Index B type automatic screw machines, exhibited by the Wickman Products Corp., are designed for high output, heavy cuts, close tolerances, fine finishes and versatility. They are equipped with four standard cross slides of rigid design and can be supplied with 6 or 8-hole turrets. Speed setting is achieved by cams mounted in a common block that can be changed as a complete unit. An acceleration mechanism speeds the cam shaft to reduce cycle time. A large variety of attachments reduces second-operation work such as milling, drilling and thread chasing.

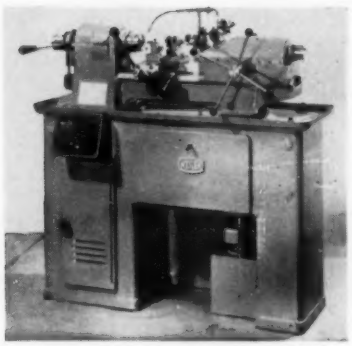
High spindle speeds were specifically designed into the Index B so the machine could realize the potential of carbide tooling. The spindle is driven by two double roller chains permitting ample power for heavy cuts. Because of the high spindle speed, rapidity of spindle reverse and rapid speed changes, the clutches are air cooled. Outer rings are shaped similar to a ventilator to prevent excess heat in the friction rings.

Spindle speed has been stepped up to 10,000 rpm on the Strohm M105 Swiss type automatic shown by Hudson Automatic Machine & Tool Co. This automatic has a capacity of 0.394 inch, uses five turning tools and is capable of turning a 4-inch length. The base is rigid and micrometer calibrations have been spaced further apart for easier and more precise adjustments. New attachments provide for straight slotting, back drilling, cross drilling and material feed for small diameter parts. Hudson will also show a cam milling attachment for use on any milling machine. It will handle Swiss and Brown & Sharpe cams up to 9¾ inches in diameter and bell cams up to 7⅞ inches in diameter.

Hardinge Brothers, Inc., will show their Model HLV high-speed toolroom lathe. While this basic machine is not new, several new features have been added to increase its over-all utility. All Hardinge precision lathes now have pushbutton spindle speed control. Two buttons on the control box, located over the headstock, can be pushed to increase or decrease the spindle speed anywhere within the range of the machine. Time is saved because the machine need not be stopped for a speed change and because the correct speed can be used for the particular combination of cutting tool, material and workpiece diameter. Hardinge precision chucking machines now feature independent electrical variable-speed carriage feed and automatic 3-selector variable-speed drive.



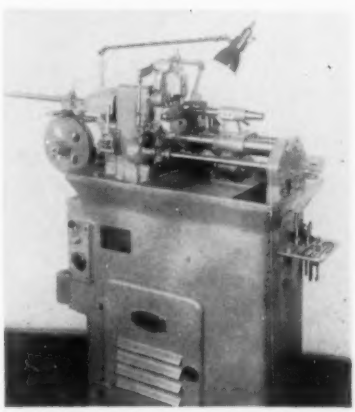
**Spindle speed has been raised to 10,000 rpm on a Strohm Swiss automatic.**



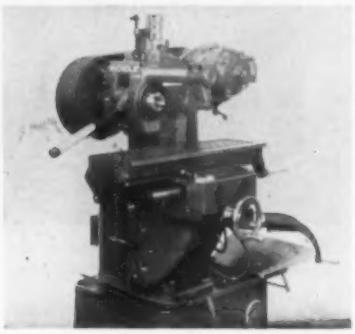
**Weiler hand turret lathe has single lever control over most operations.**

Having 16 spindle speeds from 45 to 2000 rpm, the T. S. Harrison hydraulic copying lathe shown by Stanley Sheppard can produce master templates and then copy them in batches. The hydraulic copying device comprises an independently operated real tool slide fitted to a hydraulically operated angle slide. This unit is mounted on the machine saddle. Automatic control of the hydraulic slide is by means of a spool type valve directly connected to the tracing stylus. An over-riding hand control provides for rapid tool in-feed and withdrawal.

A low-cost method of modernizing standard ram type hand turret lathes with a hydraulic turret drive has been designed by A. W. Cash Co. The unit can be adapted to the lathe in its standard form, no special parts are required and none of the parts of the lathe have to be removed to permit installation. This unit increases machine and operator efficiency and reduces fatigue. Cash will also have an automatic cross slide that is timed from the ram. Together, these units will give automatic operation for six turret stations and the cross slide.



**Traub single spindle automatic shown by Guthery is simple to set up and can be used on long or short runs. It has a single vertical slide and a counter.**



Manually operated Nichols miller.

**Threading Attachments:** All Landmatic hardened and ground die heads made by Landis Machine Co. have been redesigned and now feature a rapid-change size adjusting mechanism. The new mechanism provides precision movement and positive locking. One notch of movement in the adjusting ring represents 0.0005 inch on the pitch diameter of the workpiece. The Lanroll thread rolling attachment has recently been adapted for precision rolling of tapered pipe threads. To produce the taper, the rolls are supported on carbide shafts inclined to the taper of the thread. Roll threads are parallel to the roll axis and thus have a constant helix. This feature provides attachment stabilization (minimum sideward movement) to permit rolling directly to a shoulder with safety. By using parallel rolls, slippage between the rolls and the workpiece is reduced and results in longer roll life.

## Millers, Shapers and Hobbers

In metalworking operations, the milling machine is in a good competitive position. The small, plain, milling machine of a few years ago has been changed into a multi-operation machine to meet complex production problems. Milling can remove metal at high rate and it is also an excellent finishing operation. Full advantage of the high rate of metal removal can only be realized when manual operations, in the control of the machine, are simplified and reduced to a minimum. Time and work-saving devices have been developed to greatly lessen manual operations.

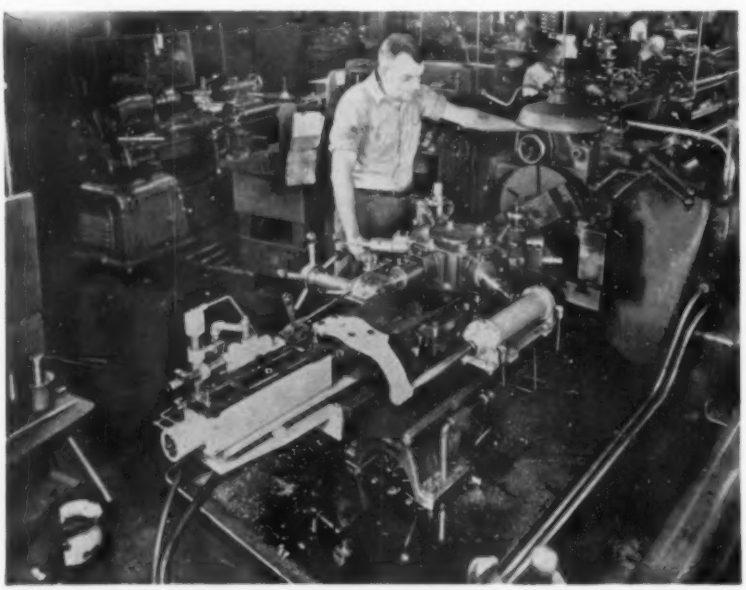
The standard Nichols Miller is a manually operated horizontal type precision milling machine. In addition to the conventional movements of the table, saddle, and knee, the spindle is mounted in a counter-balanced sliding head that allows the cutter to be brought to the work, as in sinking a Woodruff keyseat. The Model 8-SA production miller provides spindle speeds to 5000 and features an 8½ by 30-inch table (14-inch pneumatic longitudinal feed). Also, a heavier knee and saddle are provided. In addition, the machine can be furnished with pneumatic transverse feed, and pneumatic rise and fall spindle movement. Automatic feeds in two directions can be synchronized to produce a fully automatic cycle.

Nichols twin mill is something new in duplex millers; a precision two-spindle bed type miller designed for simultaneous milling of opposite or adjacent surfaces either horizontically or vertically. Two geared milling heads are independent units with separate drives and controls. They may be quickly adjusted, not only vertically and transversely with respect to each other, but may be offset longitudinally as well. This three-way adjustability of each milling head adds a degree of flexibility not found in ordinary duplex millers. It allows simultaneous milling of two widely separated surfaces on one setup and with one work-holding fixture, with obvious savings in time and tooling cost. The mill has a range of spindle speeds from 55 to 2050 rpm and a complete automatic table cycle with rapid approach. It can also be arranged to include automatic spindle head retraction and a rough and finish milling cycle.

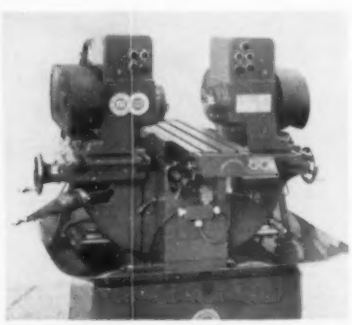
Tree model 2UVR vertical mill.

A new, more versatile vertical milling machine has been developed by the Tree Tool and Die Works. The new mill, model 2UVR is designed for use in toolrooms, experimental departments and pattern shops or for production. Features of this new mill include fully universal head, variable-speed spindle drive, variable quill feed, automatic collet closer, roller spindle drive, spindle brake and enclosed micrometer depth stop. A one-clamp turret lock, built-in power table fee, rapid traverse and a one-shot oiling system have been designed for ease of operation and greater work capacity.

Following the design trend for ease of operation, Adcock & Shipley, Ltd. designed



Cash hydraulic turret lathe drive adapts hand operation semiautomatic. Accessory unit leads to higher production and reduces fatigue.

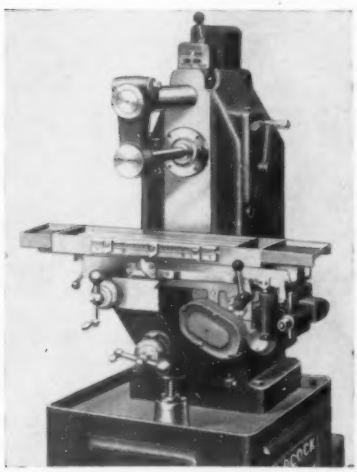


Nichols twin mill with automatic spindle retraction.

Model 2AG plain and universal milling machine for use both in the toolroom and on the production floor. The large-diameter alloy steel spindle is mounted on two pairs of dual-purpose roller bearings, the front bearings being of the tapered type. The table and saddle have large bearing surfaces accurately scrapped or ground and fitted with adjustable gibs. Trip dogs at the front of the table, controlled by a control lever on the saddle, are protected from swarth. The knee has wide and long bearing surfaces for the saddle and column. A conveniently arranged clamping handle locks the knee solidly in any position. Feed changes are made through the feed change gearbox on the knee. Nine rates of automatic feed are available through conveniently placed levers. All gears are of nickel-chrome steel and heat treated. The reversible feed motion is controlled by a lever on the saddle. The machine has hand and automatic longitudinal traverses and hand operated vertical and transverse movements. All traverses have lever locks and all adjustable stops are carried in T-slots.

A built-in electrical coolant pump, mounted on the base reservoir, provides an ample supply of coolant. Lubrication to the speed change gearbox is also controlled by a pump. A large-flow oil indicator mounted on top of the column incorporates a filter that is clearly visible at all times. The system is automatic and requires a minimum of attention. The feed change gears run in an oil bath. Drive is by horizontol foot-mounted motor through V-belts to the main drive gearbox. Electrical control is through a built-in pushbutton panel on the side of the machine.

Adcock and Shipley horizontal milling machine tables have hand and automatic feeds. Engagement and disengagement is usually made by a lever at the front of the table. Adjustable trips limit the table traverse as required. Main drive motor and coolant pump are housed in the base and are easily accessible for adjustment. All machines with two or three phase motors are fitted with reversing controls. Adcock and Shipley machines are distributed by Stanley Sheppard.



**Large diameter spindle of Adcock & Shipley milling machine is mounted on two pairs of precision roller bearings.**

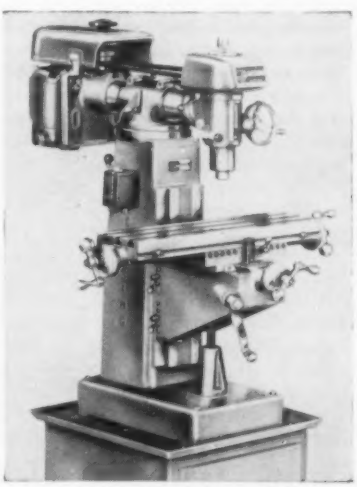
**Production milling of complex wire stitcher guide nozzle. Precise Products Co. power quill with midget carbide mills removes metal quickly and leaves an excellent finish requiring less work.**

Production versatility and less material handling time lead to reduced production costs. The Quartet milling machine of the U. S. Burke Machine Tool Div., Cincinnati Mfg. Corp., combines in one unit the functions normally associated with a complete milling department. It can be used efficiently for horizontal, vertical, angular and universal milling, with change-over from one type of milling to another extremely short and simple. It is possible to mill, drill, face, bore and slot a workpiece on the Quartet, without the use of fixtures, and without changing the setup.

For example, a die block can be clamped to the table, the sides straddlemilled with the horizontal spindle, and the top faced by using the independent vertical spindle head. Next, accurately spaced holes can be drilled on the top and sides by using the quill feature of the vertical head. Then, these holes can be bored both quickly and accurately by means of the quill power feed. If it is necessary to cut angle slots in the die block, or perform other horizontal milling operations, the turret in which the horizontal head is carried can be indexed to the required angle. The horizontal spindle has an infinitely variable feed rate, with provisions made to change the feed rate during a cut. This is another time saving feature as it permits inching the feed up to achieve the optimum feed rate.

Frequently, it is necessary to mill a radius. This too can be handled on the Quartet, using either the horizontal or vertical spindles. Many production jobs can be economically handled on the machine, particularly those involving a horizontal and vertical operation that can be performed in one pass. The wide range of speeds provides the opportunity to use carbide tooling to its full advantage, and the speed of change over for various types of milling is both a time and labor saving factor.

Irregular shapes require copying or tracing from a master. Machines for direct tracing by contact operate as duplicators or pantagraphs. The difference is that the duplicator requires a master while a pantagraph permits the use of a master made to a different scale. Each of these machines can be used for two-dimensional or three-dimensional shapes. Reduction in labor is effected by high-speed operation of cutters and by partly automatic operation. Semi-circular shapes which often occur in dies are produced by machines with oscillating heads. On three-dimensional masters the



**The Clausing vertical mill machines at all angles with one work setup. Precision spindle head has 7 ball bearings and quill bearings seats are honed.**

**Rugged Pfauter hobbing machine has been developed to take advantage of increased production that results from higher hobbing cutter speeds.**

tracer reciprocates over the master, scanning a rectangular area. With numerous attachments such machines can operate automatically, resulting in simplification through elimination of manual operations.

The New England Machine and Tool Co. (Pratt & Whitney) has designed two special-purpose, tracer-controlled milling machines. An airfoil milling machine and a cam milling machine, both utilize a non-contacting spark-gap type of tracer. The airfoil milling machine produces irregular three-dimensionally contoured parts, such as turbine blades, by copying a series or representative cross-sectional templates and automatically interpolating between them. In this machine the interpolation is determined by the continuously changing shape of a thin strip of steel spanning the templates. To utilize this interpolating element in the milling machine, a tracer system is provided which causes the cross slide to precisely follow the flexing steel strip without touching it.

Airfoil milling has proven to be a great time saver in the gas turbine industry, and this machine is used extensively in making master tooling for turbine and compressor blades. Because of its ability to interpolate surfaces between specified cross sections of the air foil, it eliminates many days of hand filing in making a master blade. It also serves as an efficient copying machine for milling blades from bar stock.

The cam milling machine is a tracer-controlled copying machine in which the master may be either a metal template or a conductive line drawing of any desired scale from 1:1 to 100:1 or more (within size limitations of the machine). The tracer system automatically follows the outline of the master drawing and, through a second tracer system following a ratio bar, reproduces its motions at reduced scale at the cutter spindle. The spindle position is adjustable laterally for making rough and finish cuts, and also vertically for milling different contours on one workpiece.

This machine is used for a wide variety of contour milling, such as external and internal cams, three-dimensional cams, airfoil templates and gages, electrical disintegrator electrodes and punches. Because of its ability to reproduce, with excellent precision, the contours of an easily prepared drawing, it eliminates much hand work. Moreover, it frees the designer from the limitations of describing contours in terms of simple geometric figures.

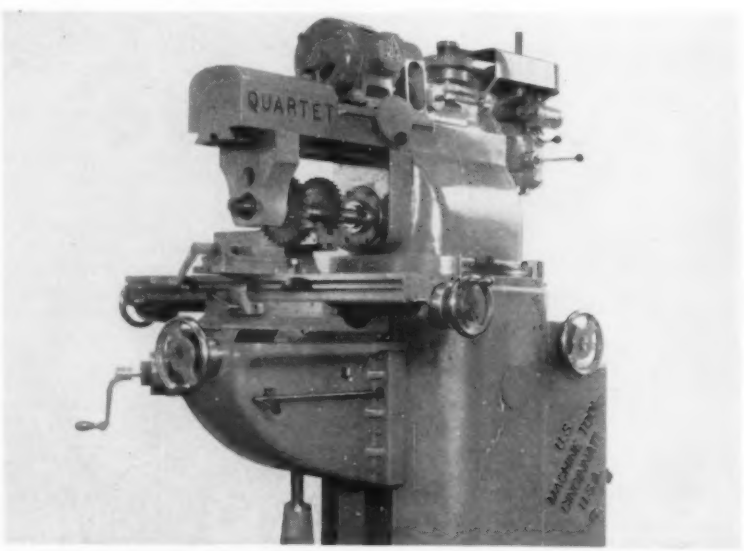
The Wickman-Hayes Tracemaster is a fully automatic profile milling machine used for three-dimensional automatic copy milling of dies, forging dies, plastic dies, etc., rubber and glass molds, turbine blades and workpieces of irregular shape.

Since it copies automatically from a master, the machine eliminates the use of highly skilled labor. Both cross feeds and vertical feeds are automatically controlled and thus, a constant rate of feed relative to the form being copied is maintained automatically.

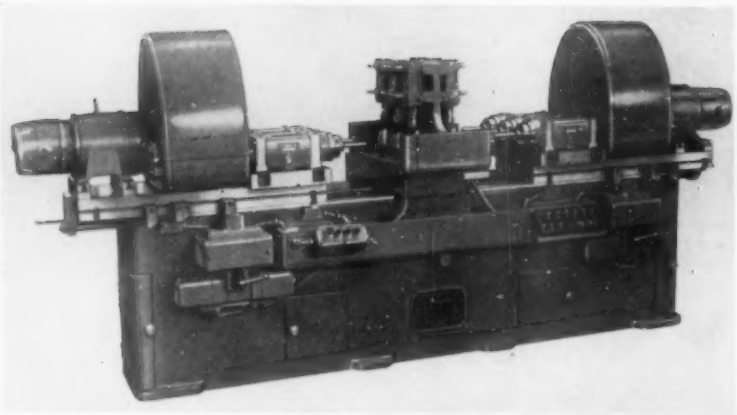
Due to its high precision, the machine is particularly useful in the manufacture of small plastic dies, which, after finishing on the machine, require very little hand finishing. Another time and labor-saving aspect is its easy operation and the short time required to reset it from one job to another.

Another extremely useful feature of the Tracemaster is the fact that it will accurately and precisely copy cavities with vertical faces without danger of the cutter digging in. Since the machine does this automatically, again highly skilled labor is unnecessary.

Continuing the trend for fast metal removal, a shaper designed especially for the use of carbide tools has been developed by Schlenker & Company (Eric R. Bachmann Co., Inc.). The machine features a heavy V-shaped ram, which slides in plastic guides. Because of this, wear on the V-ram is minimized and the V-shape cross section of the ram guarantees automatic prevention




**Straddle milling operation. Note vertical head on back of machine.**



**Simplex hydraulic feed precision boring machine handles six pistons during finishing of wrist pin holes. Machine works on three at each end at the same time.**

of play that might arise due to wear. The machine has a maximum stroke of 33½ inches and a table cross feed of 31½ inches. Eighteen ram speeds allow rates of 6 to 108 strokes per minute. The machine table is equipped with vertical and horizontal rapid traverse.

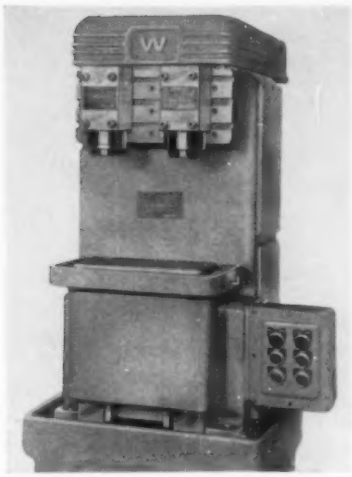
Growing application of hobbing has brought about the development of high-speed hobbing machines. Many hobbing machines now in use are not designed to operate for any length of time under the conditions imposed by high-speed hobbing. A machine to do this operation must be heavier and more rigid. The Pfauter Machine Co. has designed a new gear hobber for large gears. It introduces a new concept to hobbing, called "diagonal hobbing" and extends tool life when hobbing at high speeds.

The machine features selection of feeds and speeds by dial control (no pick off gears). Diagonal hobbing avoids necessity for special hob shifting attachments. Also, the hobber has a heavy work arbor support column eliminating the overarm. The machine has a universal hob head for both longitudinal hobbing (spur and helical gears) and tangential hobbing (worm gears). Both hob directions can be combined for diagonal hobbing. Setting of tooth depth is by dial rather than movable stops. A selector switch gives various fully automatic cycles.

Three lubrication systems provide oil to potential trouble spots for longer machine life. Automatic chip removal is obtained by a motor-driven conveyor belt. Also contained in the machine are a hydraulic backlash eliminator and a dual-lead work gear drive for both hob spindle and table. Standard speed range is from 60 to 380 rpm. To production engineers in job-shop production, this machine means reduced setup time because of the ease of changing speeds. Also, cutting time is reduced by using the higher feeds and speeds made possible by the rugged design of the machine. For engineers in mass-production shops, this machine means high-speed hobbing with normal tool life.

The new Pfauter can be used for crown hobbing with special hobs, a most important feature when coarse pitches make crown shaving difficult or impossible. Since speeds and feeds are changed by electrical controls, two-cut automatic operation is possible. This means that speeds and feeds for the first cut and higher speeds and feeds for the second cut can be preselected. The machine will make the first cut, automatically return and make the second cut using the higher feeds and speeds. This machine can be used in an automatic line by adding a fully-automatic loading and unloading accessory. The machine is available in two sizes, P500 with 20-inch capacity, and P900 with 36-inch capacity.

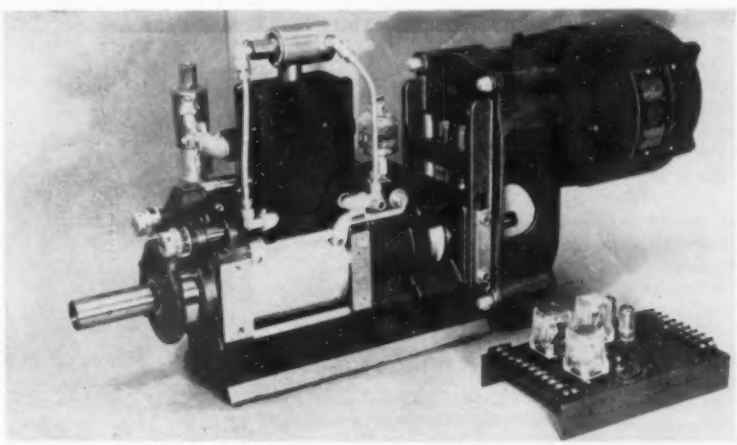
Actually the basic design of the milling, shaping and hobbing machines has not changed over the past few years. However, with the introduction of carbide tooling the speeds and feeds have been increased. Now with the introduction of ceramic tooling, basic designs may change to such an extent that they will perform operations unheard of today. Not only can operations change in complexion in the future, but control of these basic machine tools may be removed from a human operator.



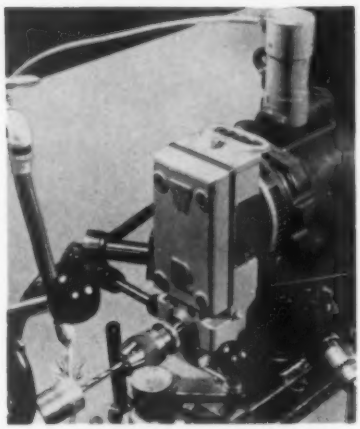
**Designed for precision boring, counterboring, facing and chamfering, the Wadell VBM is intended to speed production of small and medium parts.**

## Hole Production

The trend in hole manufacturing in the last few years has been to higher speeds and feeds, and toward tools and machines with increased versatility. High-speed steel and carbide-tipped drills, and high-speed steel and carbide-tipped boring tools have increased the need for high-speed machines.



**Hause model 24 Holomatic equipped with tap hole drilling attachment.**



**Ward-Riddle drill speeder.**

Production engineers have increased speeds and feeds to improve tool performance. Not content to stay within the scope of conventional machines especially with the increased use of high alloys, the engineer developed new approaches to the problems.

**Boring:** A successful departure in the construction of a horizontal boring machine has been accomplished by Scharmann Machine Corp. Departing from the accepted method of hanging a heavy headstock on flat ways on the side of a column, they have introduced the use of round columns through the headstock itself. The spindle is between the supports avoiding twisting of the headstock or deflection of the boring spindle. The headstock is further guided at the rear of the arm on a special gib. A conventional cast column provides a third point of suspension for the headstock. The use of a concentric lead screw in the boring spindle, represents another departure from heretofore accepted practice and imparts to the spindle the desirable pressure of thrust without eccentric pressures. An automatic tool ejector speeds tool changes without the possibility of damage to spindle or tool.

The table is designed as a fully powered rotary in which all feeds and rapid traverse in either direction can be transmitted to the rotating element to facilitate circular machining operations. Design of the table and saddle departs from the usual in that both units are of block design so that, when locked together, they form rigid unit without overhang. Included is a new method of locking, releasing and pressure relieving the table. Without individual bolts, a single handwheel speeds operation and assures accuracy.

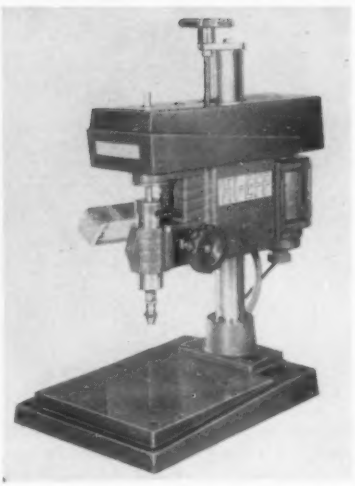
An optical measuring device can be used on the headstock or on the outrigger support for the table. Accurate to within a 0.0005 inch, it employs microscopes and engraved glass scales, and permits settings to close tolerances. Creep feed permits jogging in increments as low as 0.0002 inch and makes rapid mechanical setting possible with reduced setup time, often a major part of production time. All feeds and spindle speeds are through PIV drives. This makes it possible to select the correct speed or feed. These and other features of construction and design are new and keep boring mill construction in pace with production and requirements.

For semifinish and finish boring of wrist pin holes, Simplex Tool Corp. has developed the Simplex 2U 2-way hydraulic feed precision boring machine with six precision boring heads. A hydraulically clamped work-holding fixture holds six pistons. The operator loads one side of the machine, three pistons, while the other side is boring. At 100 percent efficiency, this gives a rate of 375 pistons per hour.

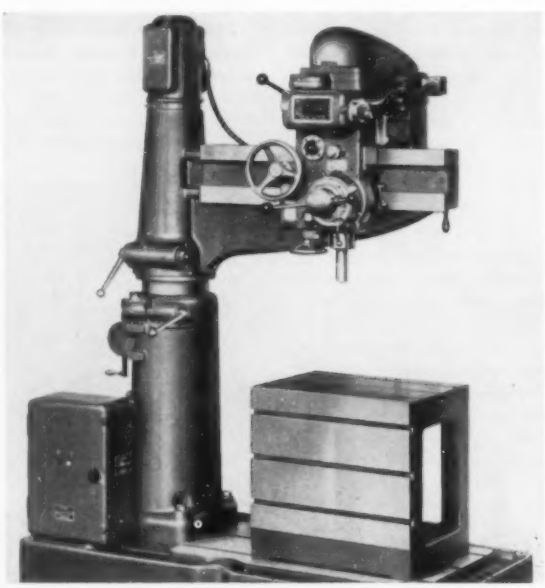
Featuring an intermittent or continuous automatic cycle, the Wadell automatic vertical boring machine can be put into automatic production lines in single units or in multiples. The machine, designed by Wadell Equipment Co., has a maximum stroke of 4 inches, a maximum spindle speed of 8000 rpm and is capable of maintaining tolerances as close as 0.0001 inch when properly tooled. Surface finishes of microinches, RMS, can be achieved.

**Jig Borer:** A Dixi (M. B. I. Export & Import Ltd.) machine is designed to handle a wide variety of boring, milling and turning operations with great accuracy. It combines high precision with large production. This has been achieved by a scientific design embodying important new ideas and improvements. The results compare favorably with machines designed on conventional principles. Great care has been taken to produce high quality machine surfaces (up to 40 points per square inch for scraped mainways). Ample lubrication and generously dimensioned ways are provided and all horizontal ways are fitted with efficient protection covers. The boring table of the machine is of a swiveling type and is turned by means of a worm and gear drive.

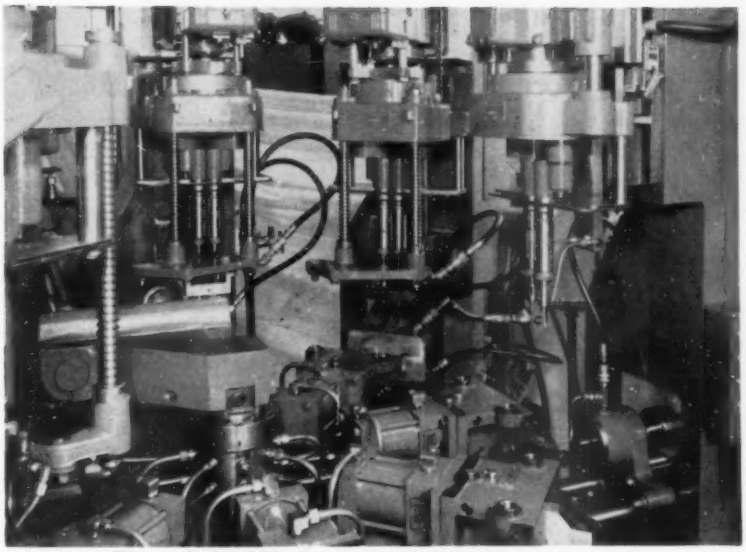
Angular setting of the table is optically controlled by means of circular graduations,



**Hi-Eff sensitive precision drilling machine drills holes in range of 0.001 to ⅛ inch with a high degree of accuracy.**



**Adcock & Shipley radial drilling and tapping machine has power elevated column. Another basic machine features twin bases for setup ease.**



**Wisconsin Drill Head automatic lead screw tapping unit.**

arranged inside the table. The table can be swung around by hand through 180 deg, with the worm drive disengaged, for machining both sides of a workpiece. The transverse and longitudinal feeds of the table, and the vertical feed of the spindle head are hydraulically controlled and can be adjusted from 0 to 78 inches per minute. Ordinary scales allow the table and headstock to be set hydraulically, while special attachments allow fine adjustments to be made by hand. Fine adjustments of the spindle head, table and column are made through optical microscopes and with precision scales. This machine has the accuracy of a vertical spindle with the versatility of a horizontal spindle. The Dixi does not operate on one single plane as a vertical-spindle machine does, but in all planes with optical setting accuracy. A workpiece can be finished in one setup on all sides except the clamping surface. Complicated pieces can be optically inspected on the machine avoiding accumulation of errors that would result from repositioning.

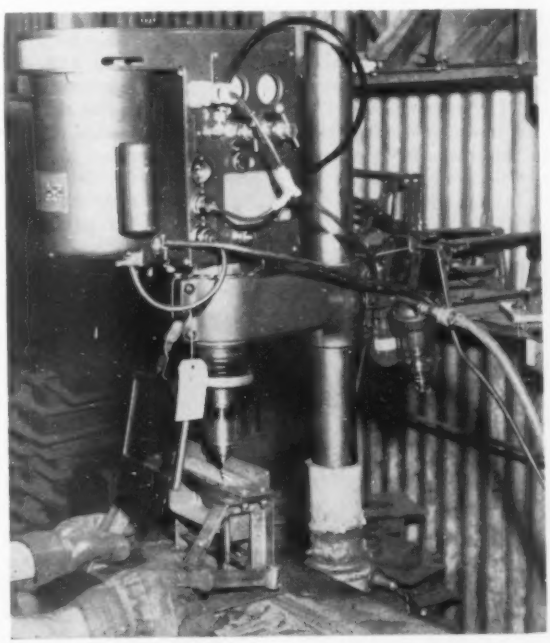
**Aro automatic drill.**

The machine bores with locked spindle feed while moving in with the hydraulic table feed. This constant tool condition generates a true round hole which can be repeated by rotating the workpiece 180 degrees. True alignment is achieved optically without any need for rework. This is of great advantage in producing pieces such as gearboxes, that require close-tolerance alignment. Any compound angle can be achieved by the use of two rigidly mounted optical indexing tables. This avoids use of tilting tables, which are subject to mechanical wear and thereby defeat the purpose of optical accuracy. Costly jigs and fixtures are not required and the machine can be applied to medium, short-run and experimental work. Design changes, inherent in frame and similar production, can be executed without delay. The design of this machines points to the saving of considerable time and money.

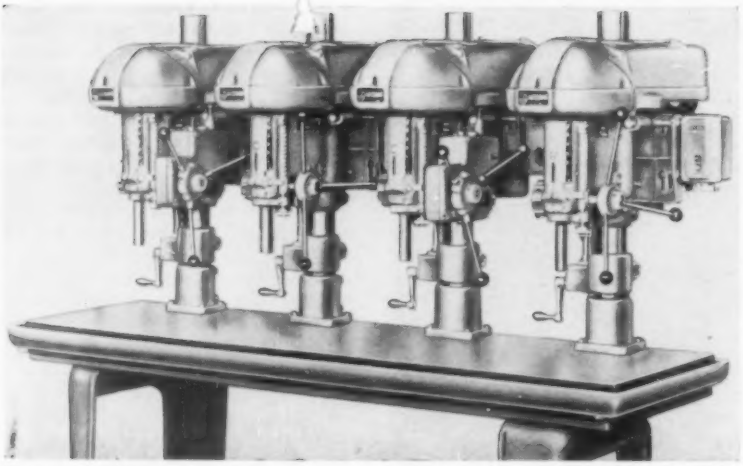
**Drilling and Tapping:** The Hause Double End Machines (three basic styles) are standard units designed for high-production drilling, tapping and other end-cutting tool operations. The machines include a steel weldment base, two Model 24 Holomatic units, air and electric power systems and cycle control. These machines are designed so that a user need only furnish and mount fixtures to start a production run. The Holomatic units can be positioned over a wide area to machine holes that are opposed, offset, angular and up to 35 inches apart. Multiple spindle heads can be used for machining several parallel holes from either or both sides.

Automatic devices such as air clamps, index tables, shuttle tables, part feeders and escapement units can be quickly installed and easily interlocked with the operation of the unit. The Holomatic units are rated at 2 hp and can be equipped for operation of the spindle at speeds of 190 to 10,000 rpm.

The Hause Automatic Drill Press is a standard unit designed for performing high-production, drilling, tapping and other operations normally performed with drill press equipment. This unit combines a Model 24 Holomatic unit with air, electric power and cycle control systems, mounted on a steel weldment. The Holomatic unit is air powered and contains a sealed hydraulic system that affords a positive but flexible method of spindle travel control. Rapid travel, feed and stroke length are all adjustable in both advance and retract



**Manually drilling #42 holes in burner parts previously required skilled operators. Dumore unit, mounted on drill press column, improves production and permits use of unskilled operator.**



**Clausing heavy-duty multiple spindle drill press is constructed ruggedly, has a 22x84 in. working surface. Distance between spindles has been increased and the units are powered to drill 1-in. holes in cast iron and ¾ in. in steel.**

movements. A positive stop control affords repeat depth accuracy to 0.0005 inch. A built-in cycle control provides for synchronized operation of the Holomatic unit and other components such as index tables, air clamps, shuttle tables, part feeders and other part positioning and clamping devices.

The Model 24 Holomatic drill unit when equipped with the new F222C deep hole drilling attachment is an efficient deep-hole drilling machine. Holes from approximately 0.025 to ⅝ inch in diameter can be drilled in mild steel up to 3¾ inches in thickness. Positive hydraulic control of the spindle rapid traverse and feed allows the drilling of work-hardening materials such as stainless steel as well as extremely soft materials such as copper. Length of rapid travel on the first advance stroke, feed rate, over-all stroke length and the number of withdrawals per hole are all adjustable. The drilling action is progressive. At each step, the drill withdraws, then rapidly approaches but does not touch the bottom of the previously drilled portion of the hole. Drill advancement per step is a function of the feed rate and time, established with an electric timer. The timer incorporates standard components and all relays are of the plug-in type.

The deep-hole attachment can be disconnected as required (without removal) for regular operation of the drill unit. A deep-hole drilling attachment can be used as an individual drilling machine or can be incorporated as a head into a special drilling machine.

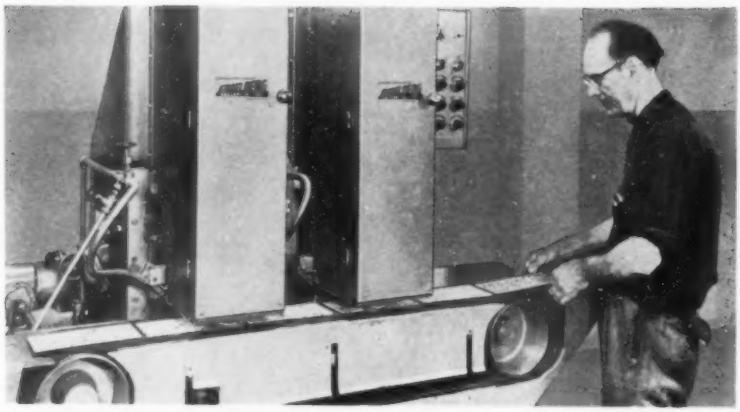
A radial drilling and tapping machine designed by Adcock & Shipley Ltd. (Stanley Sheppard), contains twin bases for high production. One base can be loaded while the other is in use. The elevating column on this low-base type machine is a feature that has proved to be desirable, giving all the advantages provided by an elevating arm machine but with the rigidity of a solid type arm. This construction prevents undue deflection. The horizontal slide is elevated on a large-diameter column through worm and pinion gearing onto a steel rack. A lock is provided to secure the column in desired position. Power elevated machines have the raising and lowering motion controlled by a small independent motor at the side, driving through a suitable gearbox. Adjustable stops are arranged on a trip bar, controlling the travel. Hand elevated machines are also available. For versatility of production, a swiveling box table can replace the standard box table.

A new sensitive precision drilling machine has been designed by the Taylor Dynamometer and Machine Co. Designed for hole drilling range of 0.001 inch to 0.125 inch, this machine has combined spindle and chuck runout held to close tolerances. Ease of drilling, especially for small holes, long life and reduced cost of this machine make it attractive.

A universal jig base used in conjunction with turret drilling and tapping has recently been developed by Howe & Fant Inc. This universal jig base is low in cost and makes possible rapid and accurate positioning of work under the turret spindles, all of which work along the same vertical axis. Resultant savings in handling time and in down time required to sharpen tools are dramatic. Because of the accuracy of this base, rejects are minimized. A compact unit, the Ward-Riddle Drill Speeder, contrarotates the drill (relative to lathe spindle rotation) at a preselected rate. This enables the drill to cut at the proper surface speed. Rate of feed may be increased in approximate proportion to the increase of surface speed. This means that many drilling operations can be performed efficiently and economically on a turret lathe. In many cases the necessity of moving a workpiece to a drill press for deep-hole work is avoided. In addition to the substantial time savings realized, there is a

**Bux magnetic drill press showing complete unit with drill attached.**

**Bux special electromagnet magnetically holding plates.**



Engelberg-Huller multiple head conveyor type grinder.

corresponding increase in quality of finish and accuracy. Freer cutting action results from the increased cutting speed.

The units can be mounted quickly and easily on ram type turrets. A rotating electrical connector allows continuous turret rotation. The drill speeders are complete with motor, rotating electrical connector, and "on-off" footswitch wired to connector and motor. Models are available with V-belt or gear drives. Speed changes are effected quickly and conveniently by shifting V-belt, or interchanging pulleys or gears. Drill capacity ranges up to $1\frac{3}{16}$ inches in tool steel. All bearings, including motor, are antifriction and the spindle is mounted on super-precision ball bearings.

Another unit that is of interest to production engineers is a new drill speeder for gun drilling operations. Similar to the drill speeder for turret lathe use, this unit includes provisions for piping coolant through hollow center drills.

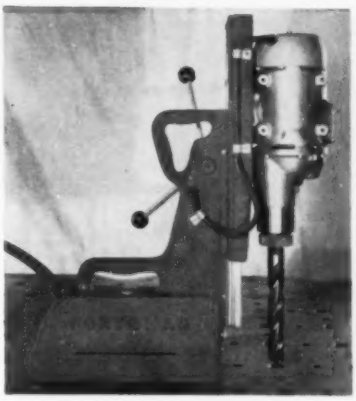
Manufacturers of drill presses, noticing the demand for power feed devices to speed drilling operations, have included pneumatic feed as standard equipment and have designed different drilling machines to incorporate the use of pneumatic or hydraulic power. Since pneumatic power is hard to regulate smoothly, hydraulic checks are now included. Engineers at the Mead Specialties Co. have designed a system that uses a helical channel for the oil flow. With this design, the speed of flow changes in proportion to the length of the channel. This system is not subject to vapor lock.

Operation of this system is simple. Power is supplied by a double-acting air cylinder and regulated by a small hydraulic cylinder and control valve. The air cylinder supplies pressure for the downward feed of the drill and returns it to the starting point after it reaches a preset depth. Hydraulic checks maintain uniform speed regardless of soft spots or break-through points yet allow rapid approach to the work. The air-hydraulic drill press feed is designed to do better, more uniform work at a higher rate of production with less fatigue and monotony for the operator. It combines easily with other air-operated equipment to form automatic machines.

In an effort to reduce costs for small shop owners, the Electro-Mechano Co. has designed ¼ and ½ inch air-operated, hydraulically controlled automatic drilling units. They comprise a complete drilling unit with electrical motor-driven spindle and hydraulically controlled air-operated feed. The spindle feed and speed are under separate control. Spindle travel is provided by an inline double-acting air cylinder. The feed rate is controlled by a closed hydraulic system. An induction type motor, with variable sheaves, provides stepless speeds from 600 to 4000 rpm. Since speeds and feeds are easily varied, units can be readily changed from one job to another.

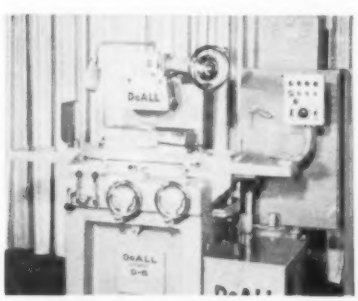
Tool engineers will be particularly interested in Dumore's method of mounting their Drill-N-Tap Unit. It not only reduces tooling and engineering costs but permits the application of automatic equipment to single-spindle operations. The built-in controls and the ease of mounting permits rapid conversion from manual to automatic operation on single-spindle drilling and tapping applications. By freeing the operator's hand for faster loading and unloading, production may be increased substantially.

A new automatic drill produced by Aro Equipment Corp. has a range of speeds and capacities enabling it to be applied to a wide variety of production jobs. Adjustments provide for pushbutton starting, controlled feed rate, controlled rapid traverse, and automatic return and shut-off after preset stroke length has been reached. It can be started manually or by automatic remote control. A wide range of nose housing adaptors, drill guide bushings and lock-liner bushings are available to make it practical for most installation requirements. Cost savings are achieved through faster time cycle, reduced man-hours and greater accuracy, which means better quality and fewer rejects.

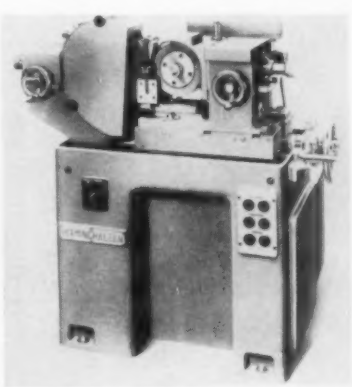


Electromagnetic drill press showing variable switch on the left.

Wisconsin Drill Head Co. is introducing a new automatic-lead screw tapping unit that can be used in conjunction with a standard Wisconsin adjustable tapping head or any desired fixed head. Time required to change lead screws, spindle speed and spindle travel are short. Special machine modifications can be made at low costs. This unit will allow a tool engineer to develop a high-production drilling and tapping machine in little time. Different




Surface grinder showing electrical control panel.



Precision centerless grinders with a ¾ inch bar capacity.

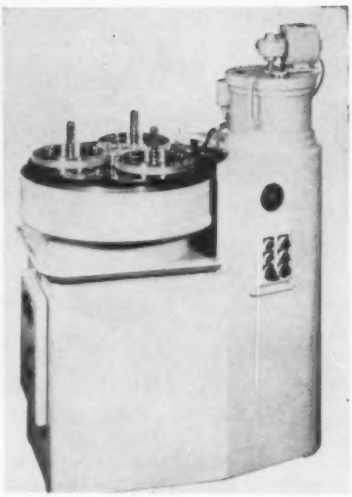
Esbec series HD Model 3232 with safety guard in operating position.

construction provides positive protection for tap against end thrust. Should tap try to enter undrilled hole, spindle stops.

The Par-A-Matic Drill designed by Aro Equipment Corp., is recommended for a majority of drilling jobs that do not require the power, size and extreme accuracy provided by an automatic drill. The Par-A-Matic is used with a remote-control valve and can be linked to such valves in a wide variety of ways. Starting and stopping must be performed by remote control, which can be regulated by an operator, or by a solenoid or air valve. Three-position valve and head provides various methods for regulating thrust and return. Feed is regulated by a needle valve which admits compressed air against a spring-loaded piston. A spring accomplishes piston return and exhaust air can either be ported to the atmosphere or controlled through the needle valve. These units are designed so they can be used singly or in a series.

An outstanding example of a hand drill is one that produces 3000 rpm yet weighs less than 1⅓ lb. Designed and built by Aro Equipment Corp., it develops high torque and easily drills 5/16 or ¼ inch holes. As a production tool, its advantages include small size and high power. The trigger is of an improved design to allow firm, positive but comfortable grip. Quality and life are improved by design features such as locked-in motor, ball-bearing mounting of moving parts and planet gearing mounted on self-contained needle bearings with no bushings. Spindle has front and back mounting to hold runout, side play and end play to a minimum.

The Model N nut countersinking machine, designed by the Model Machine Co. Inc., is a fully automatic machine developed to accurately countersink both sides of a through hole in nut blanks to a controlled depth and square with the face. The Model N will accommodate nut blanks of sizes 2-56 up to and including ½-13 through the use of different tracks. One of the primary features of this machine is that setup time is less than ½ hour due to simplification of design. Production of this machine, which is of prime interest to the tool engineer, is approximately 3000 blanks per hour on the ½-13 and over 5000 blanks per hour on the 2-56.

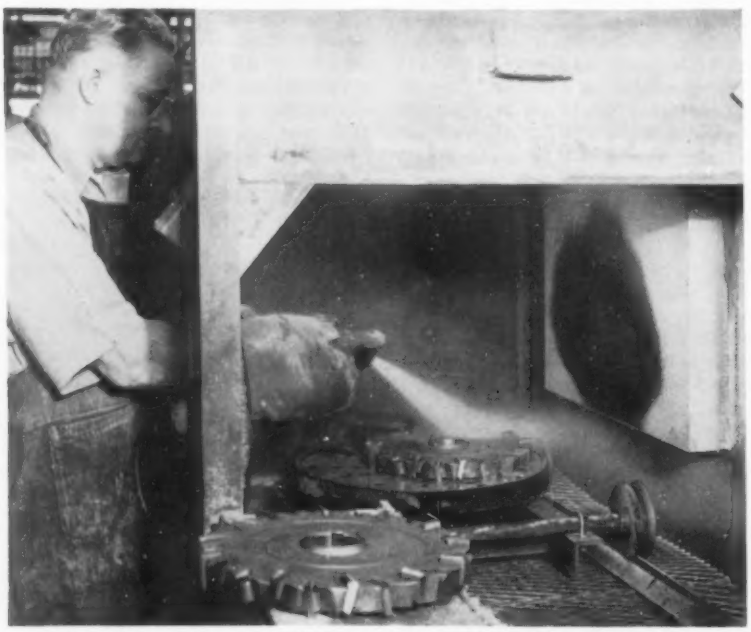


Spitfire Gyro-Matic lapping machine.

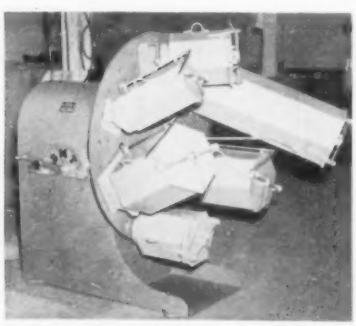
Significance of magnetic holding, as applied to a portable drill press, is apparent. It lies primarily in the fact that drill point pressures heretofore attainable only with stationary drill presses are now possible with a relatively inexpensive and portable tool. Impressive savings in time and labor result from the ability of the worker to take the drill to the job instead of taking the work to a drill press. A unit designed by the Buck Manufacturing Co. consists of a magnet mounted on the base of a rigid casting. The casting forms the slide for the mounting of a portable electric drill.

Wherever heavy plates are to be welded in line, considerable time can be saved if the electromagnet is separated from the drill of the Buck unit. Aligned plates can be held by the magnet while the weld is made. This is indicative of a series of additional uses for such portable drills.

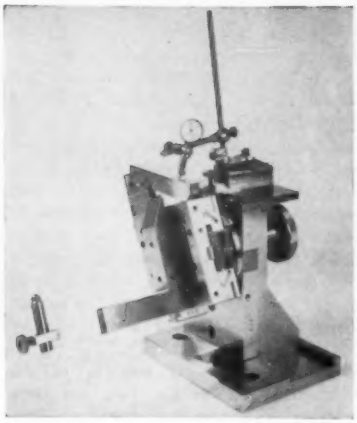
Another portable magnetic drill press has been designed by Portomag Inc. The Portomag drill unit can be positioned easily. Electromagnetic attraction can be varied so the unit can be set up. With just enough power to hold the weight of the unit against



Wheelabrator Corporation Liquamatte wet abrasive blasting machine. The tools in this picture are undergoing reconditioning treatment.



Angle mounting of barrels to increase or decrease side honing action.



**Zenith form dresser developed by Monray Corp. can dress wheel with any combination of radii and angles. Gage blocks are used to set the movements.**

the working surface, it can be moved easily. The Portomag unit has an attractive force 1400 to 1900 lb. The electromagnetic power available far exceeds that required for normal drilling. After the drilling or tapping operation has been completed, a demagnetizing circuit allows immediate and effortless removal of the unit from the working surface. This drilling unit can be equipped with a reversing switch so that it can be used not only for drilling and reaming, but for accurate tapping.

## Grinding and Finishing

Surface finish is of major importance to the production engineer today. Since closer tolerances and finer surface finishes have been coming in during a period of increasing competition, the tool engineer has had to meet the new requirements while at the same time he has been reducing costs.

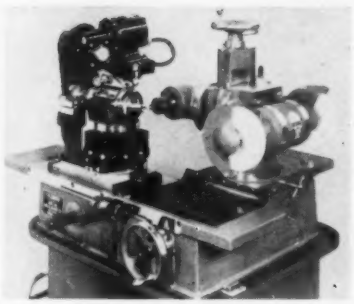
New DoAll grinders are being used to grind parts to desired dimension without removing them from the machine to determine how much material is still to be removed. These machines have rigid spindles, bases and columns to prevent deflection that would cause improper wheel wear and, therefore, loss of accuracy. The workpiece is kept cool by introducing coolant through the wheel or as a flood.

Along the same line, Giustina Corp. of America has five new grinding machines, each for a special class of work: Model PO, for miscellaneous use; Model P1, for miscellaneous use with rapid movement; Model P2, for standard production with plunge feed; Model P3, for standard production with automatic gaging, and Model P4, for standard production with automatic gaging. Model P4 includes automatic diamond dressing after a pre-established number of cycles.

Speed and simplicity have been attained by the William H. Field Co. by designing the Centra-Point grinder to mechanically perform functions which are troublesome and time-consuming on standard grinders. Previously, good sharpening depended upon the skill and experience of the operator. Now, through advanced features such as mechanical wheeldressing and self-registering tooth rests, a high degree of accuracy may be obtained by the unskilled. Other features of the machine include a direct-reading clearance angle scale, integral parallel gage for aligning end teeth and reference surfaces for alignment. This machine is specifically designed for sharpening end mills, shell end mills, chucking reamers and small milling cutters. It reduces sharpening setup time to a small fraction of that previously required.

In the Centra-Point system, a line from the center of the cutter to the tooth being ground remains horizontal. Clearance angles are obtained by tilting the grinding wheel spindle radially from the edge of the tooth. Angles are read directly from a scale on the wheel head assembly. When sharpening helical teeth, a radius is mechanically formed on the face of a cup wheel producing a datum circle tangent to the contact point of the tooth rest.

A high-precision centerless grinder with a ¾ inch bar capacity, equally suited for infeed, through-feed or barfeed, has been developed by the Herminghausen Co. (Eric R. Bachman Co.). Distinctive features of this machine are its simplicity of design, versatility and high capacity. Grinding wheel and regulating wheel spindles are carried in preloaded adjustable precision roller bearings. The grinding wheel spindle bearings are lubricated by oil mist while the feed regulating wheel spindle runs in oil. Diameter adjustments are made by feeding the regulating wheel slide toward the grinding wheel. This slide is mounted



**New Royal Oak internal grinding attachment mounted on RO grinder.**

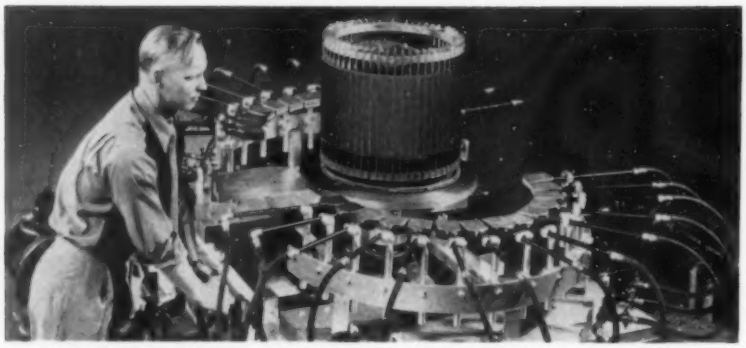
on rollers to reduce friction and the feed nut is split and spring-loaded to avoid backlash.

Adjustments can be made in steps of 0.0001 inch by means of a micrometer screw. The feed regulating wheel can be tilted, swiveled and moved linearly to match its face with the grinding wheel face. The machine was especially designed to fill the need for processing small and medium work such as cylindrical and taper pins for instruments.

By using from 2 to 6 grinding heads, multiple operations can be accomplished in the same time as required for single operations with no added labor requirements.

Unmachined surfaces, ground on a series of successively finer grits in a simultaneous operation, can be finished to a fine polish and have uniform size. The Model 680 multiple-head abrasive-belt grinder manufactured by the Engelberg Huller Co. is designed for wet or dry grinding and polishing of ferrous, nonferrous, plastic and other materials. It is especially applicable to

**Osborn power brushing machine removes burrs and blends surface junctures on complicated parts.**



**Selas heat processing tool automatically processes electric-motor rotors.**

grinding and deburring flat surfaces on a high-volume basis. Special adaptations include a turnover conveyor setup, with grinding heads installed on different levels, so that both sides of a part are processed on a single unit.

Designed for both safety and minimum space, the machine will fit into many automatic production lines. Parts can be conveyorized for presentation to the machine conveyor belt, automatically ejected and carried to the next operation. The conveyor belt can be changed in less than five minutes and the machine will not start unless the belt is tensioned. Quick manual adjustment of conveyor belt speed covers a range of 5 to 30 fpm. Control panel includes tension safety light and conveyor reversing switch. Depth of cut is controlled by individual micrometer adjustments for each grinding head. Magnetic chucks are available as optional equipment.

Designed principally for repeat operations in mass production, the BG/8FT9 wet-dry belt grinder by Engelberg is also highly applicable to short runs. The major design feature of this platen grinder is a hydraulically controlled infeed table. When the table is rolled on ball bearing ways from loading to grinding position, the two-speed infeed is automatically actuated. A quick approach to the belt surface is followed by slow feed into microstop limits. Table retraction to load position automatically resets feed for next cycle. T-slots allow attachments of angle plate, backup bars or fixtures. Because of its versatility in such operations as squaring, grinding angles, bevels and radii, and surfacing, it is also highly recommended for toolroom use.

**Elox accessory turns standard vertical die sinker into horizontal or vertical electric-discharge grinder.**

Compactly designed for minimum floor space, the L4 centerless wet or dry belt grinder by Engelberg is designed to obtain accuracy of ±0.0003 inch, with stock removal capacity varying with material processed. Such materials include ferrous and nonferrous metals, rubber, wood, ceramics, glass and plastics. The main feature of this machine is an abrasive belt backed by a rubber-covered resilient contact wheel mounted on a ground spindle. A variable-speed regulating wheel for backing up and turning the work has two swivel adjustments: one on the horizontal axis for adjusting helix angle at which work feeds through the machine, and one on vertical axis for feathering off to avoid spiral marks when the work leaves the belt.

A completely new addition to the Production Machine Co. line is a centerless grinding machine developed to fill the need of a precision machine for light-duty work. This machine will handle bar stock up to 1 inch in diameter, and tubing up to 3 inches in diameter, any length, within the weight limitations of the machine. It is built to machine tool tolerances, and uses abrasive belts running over a hardened steel contact roll. The feeding unit is also an abrasive belt, with flat platen, which permits center line contact with workpiece at any feeding angle. These features eliminate the need for periodic dressing of grinding or regulating wheels. The feed unit may also be equipped with reversing traverse when multiple passes are required. The feed unit is mounted on dovetail ways and is adjustable by feed screw and handwheel with infeed graduations in increments of 0.0002 inch for precision control. The work rest blade can be furnished in a variety of materials depending on the type of metal or material being ground.

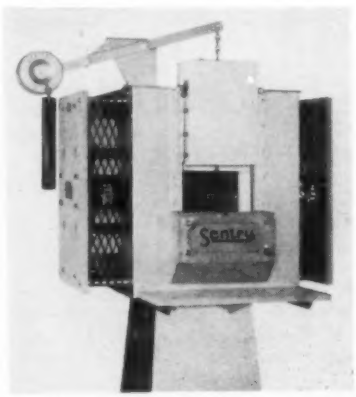
An extremely versatile machine using opposed abrasive belts backed by platens is being shown by the Production Machine Co. Properly tooled, this machine may be used for a wide variety of applications where opposite sides of stock require a grinding or finishing operation. Such operations can be performed in a single pass through the unit. The basic machine is designed so that different types of work-feeding devices and conveyors may be attached to suit a variety of sizes and shapes of work. The platens in back of the belts are adjustable for regular or angular surfaces. The machine is designed so that one or both heads are adjustable for work thickness. The adjustable head is mounted on V-ways and is movable by feed screw and handwheel. Each head is driven by a 1200 rpm motor developing a belt speed of 3500 sfpm, which is satisfactory for most applications. The coolant system is self-contained and driven by separate ¾ hp motor.

Another outstanding machine of the Production Machine Co. is a centerless finishing and polishing machine. This heavy-duty machine is designed and built to operate under continuous production loads. It will handle cylindrical work up to 1½ inches in diameter of limited weight, either straight or tapered, and will produce a variety of finishes. Work may be loaded manually, or by means of hoppers or other automatic feeding devices.

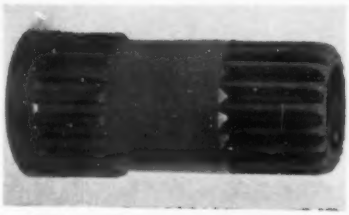
Completely guarded for safety this machine has a belt guard equipped with hinged doors to facilitate belt changes. Standard fiber work rests and single and double ball-bearing roller platens are furnished for each polishing member. Duplex machines are equipped with a connecting trough and Uni-Pull drive for motors up to and including 3 hp. A variety of finishes can be obtained on these machines using abrasive felt, leather or fabric belts. Simplicity of operation permits the use of comparatively unskilled labor, reducing finishing costs to a minimum.

J. R. Reinertson & Co. will introduce a drill grinder with true conical drill points obtained by dialing. It allows a choice of any included angle to 140 deg for all 2, 3 and 4-flute drills from ⅛ to 2½ inches.

A new web thinning machine has been imported by the Cawi Machine Co. This




**This Sentry electric hardening furnace uses atmospheric control to prevent scaling and will be available to harden sample tools brought in during show.**



**Heintz cold-extruded truck gear.**

machine is significant because it uses a patented chuck that correctly centers the drill. Drill webs are reduced by indexing the chucking spindle. Possibility for production error is reduced to a minimum with this machine and unskilled operators can be used. Also imported by the Cawi Machine Co., a drill grinder is available that can be adjusted for various included and relief angles so that in one setup, step drills, subland drills, core drills and various combinations can be ground. The main difference between this and previously available equipment is in the chuck that holds the drill concentrically on its ground margin. The chuck can automatically adjust to a slight back taper of the drill. By means of planetary gearing, the drills are rotated and grounds on both lips alternately.

A machine ideally suited for grinding circular form tools, sectional dies and punches, and gages and templates has been designed by Loewe Co. (Eric B. Bachmann Co. Inc.). This machine features a 20 by 20 inch shadowgraph screen with optical magnifications of 25X and 50X. The grinding wheel slide has a stroke of $3\frac{5}{16}$ inches and allows adjustments for lateral relief angles of $\pm 15$ deg and axial relief angles up to 35 deg. Any compound angle within these ranges can also be ground.

The machine has two optical systems; one for shadowgraph projection and one for reflection projection. The drives for the grinding wheel spindle and the stroke are steplessly adjusted through d-c motors. Combining a shadowgraph comparator with a highly precise form-tool grinder facilitates grinding complicated irregular contours.

Modern quality control demands modern finishing techniques, so design engineers at Spitfire Tool Co. have coupled pushbutton operation with precise finish. The Gyro-Matic was developed to eliminate a laborious uncertain hand lapping process and also to lower the cost of manufactured parts through production lapping. Simple operation means substantial savings of time and cost with high-quality lapping on a volume basis. With this machine, optical flatness to 1 light band (0.0000116 inch) is possible. The machines incorporate close-grained, cast-iron lapping plates heat treated to eliminate any possibility of distortion.

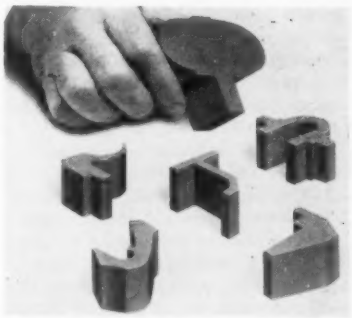
A removable circular tank, with a removable cover for easy cleaning, has a solenoid valve to automatically control the abrasive flow. A heavy-duty aluminum paddle with neoprene inserts and driven by gear reduced motor, keeps the abrasive and vehicle in correct suspension. A measuring valve controls the proper feed of abrasive to the lapping plate. The lapping plate is slotted with angular grooves to provide quicker lapping action and disposal of spent abrasive. It is supported by six precision-ground ball bearings on the outer periphery to attain lapping accuracy.

Gear retainer rings and center drive gear assure positive counter motion of parts against the rotation of lapping plate with a simulated figure 8 motion. The motion is transferred to the parts from the retainer rings through a keyed nest. This mechanism is retained in a thermosetting plastic plate. To the engineer, this means less down time on production lines due to the constant resurfacing and truing of the lapping plate by the gear retainer rings. For the automatic or semiautomatic operations of today, machine provides greater versatility for quick change-overs in various production runs.

A new approach to the problem of separating parts from tumbling media, grading of media, or separation of parts has been developed by the Esbec Barrel Finishing Corp. A new dimensional separator, not intended to replace either magnetic or vibrating screen separators, will perform many jobs that cannot be done by either of the other methods and which, until now had to be done by hand.

Separation is done by reason of differences in critical dimensions of parts and chips. Thinner or flatter pieces drop through the rolls while thicker, chunkier pieces are discharged at the end of the rolls. Four different micrometer controls quickly adjust for changes in size of material.

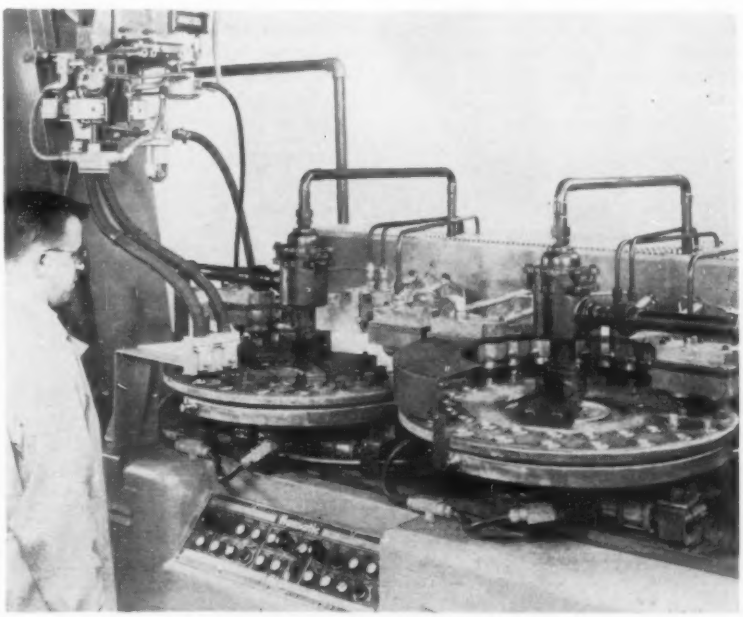
## developments in tooling



**New hot-extruded, cold-drawn sections produced on Jones and Laughlin press.**

hopper discharge, rate of feed and rate of discharge. These, combined with a three-speed drive, give the Esbec dimensional separator greater flexibility and adapt it to a wide variety of jobs. This machine can separate parts similar to phonograph needles where the difference is only 0.0015 inch.

Esbec series HD tumbling barrels require little floor space and have an unusual number of safety features including a quick-acting door that cannot possibly blow off no matter how carelessly it may be unlocked. This line includes units built especially to take heavy ball burnishing and zinc slug tumbling loads. The newest addition to the Esbec line is Model 2430



**Fully automatic Flamatic hardens 3600 hydraulic valve lifters per hour. After heating, parts automatically drop into oil quench.**

which is smaller than the standard HD line. The unit has a two-compartment drum, each with a capacity of 4 cu ft. It is intended for plants that finish many parts in small lots. A standard machine is used for abrasive tumbling and a heavy-duty model for ball or slug tumbling.

BMT multibarrel slide-honing equipment introduces a new concept in tumble finishing. It is designed to finish parts previously considered impractical. Angle mounting of barrels provides the slide-honing action. The parts in each barrel slide down the barrel, roll over, slide back, roll over, etc., with each revolution of the large rotating disk. The process is a departure from the conventional mass-weight theory. Slide-honing permits mass finishing with less down time. The controlled motion does not affect dimensional tolerances of the workpiece but it removes burrs, flash, tool marks, rust, paint, and plating and heat treating scale. Such operations as rounding corners, forming filets and bending chamfers are all successfully done and the finish is materially improved.

This type of machine permits finishing many different parts on the same machine without mixing. Barrels of the size and shape best suited for each particular part can be selected. Both dry tumbling and wet tumbling can be done at the same time. Mounting of barrels can be set to produce just the right honing action required for each separate part. For complete operating safety, the multibarrel slide honing equipment can be completely enclosed by a safety guard. With all barrels mounted in position and the machine speed set as desired, the gate must be closed before the machine will start. Varying ratios (2:1 to 8:1) of parts to abrasives can be used.

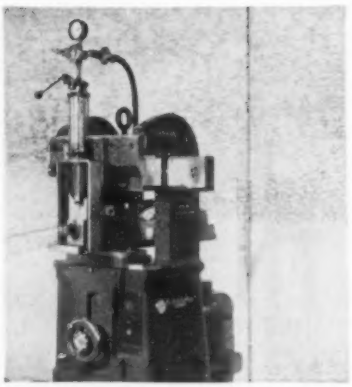
Wet abrasive blasting has been found highly successful in prolonging the lives of cutting tools. This newer use of wet blasting has prompted the Wheelabrator Corp. to adopt it in two facets of tool treatment; before plating to restore lost tolerances and to prolong effective lives of new or resharpened tools. The wet blasting treatment consists of throwing micromesh abrasives in water suspension. Compressed air propels the abrasive slurry. Eighty to 2500 mesh abrasives are used and tolerances of 0.0001 inch can be maintained.

There are a number of advantages when wet blasting is done on tools before plating. It removes fine wire burrs or feather edging that might be left on the cutting edge from the sharpening operation. When not removed, these burrs and feathers become plated and sometimes chip off when the tool is put into service, removing the plating with them. At the same time that it does the deburring, wet blasting leaves a matte type surface on the tool. This type of surface has a greater area than does a smooth one and makes possible strong bond.

Wet blasting is used again after plating. This leaves a matte surface for good lubricant retention. The tool wets with oil evenly right away and chips cut from the stock are rapidly eliminated through the flutes of the tool. Galling and tool loading are reduced.

Wet blasting of new or freshly resharpened tools before using them has been found to increase life between grinds. Data at a typical plant indicates that tools with sharp cutting edges, such as drills, milling cutters, taper reamers and broach bars show the greatest life increase. Broach bars have shown increases of 200 to 300 percent.

Life tests on wet blasted taps indicated an increase in life of about 160 percent when the taps were used in cutting threads in malleable castings and from 1500 to 1570 percent when the taps were used in steel. Milling cutter lives have been increased by as much as 300 percent and shaper cutters by as much as 50 percent when they have been wet blasted after sharpening.

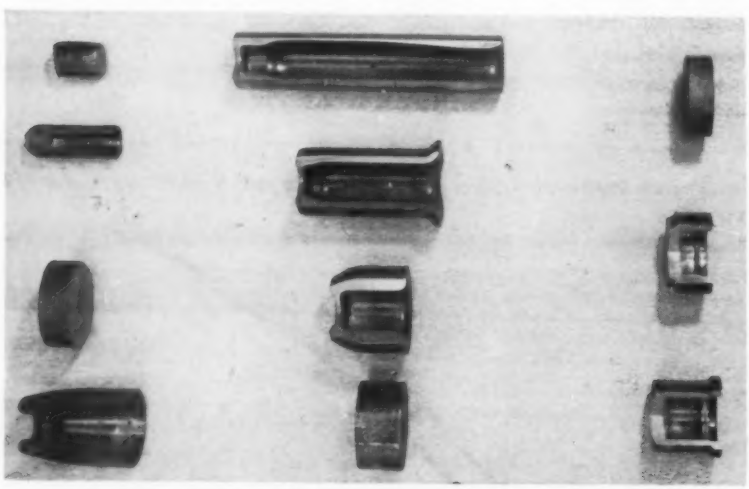


**Marking machine with pneumatic stacker feed developed by Schmidt to handle nameplates at 3600 per hour.**

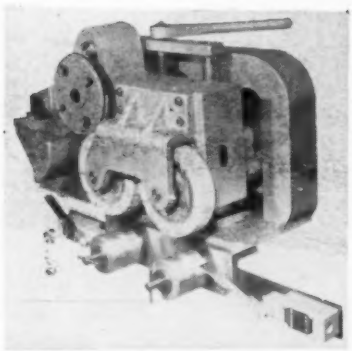
Abrasive blast cleaning can now be used for operations where thin sections had previously broken, resulting in high scrap. For example, the Rotoblast equipment of Pangborn Corp. cleans flywheel castings that have a series of 3½ inch long fins ⅛ inch thick joined to a 2 inch thick main body. To prevent breakage, these parts had been cleaned by hand methods at high costs. Blast equipment is being used to replace hand grinding operations for removing rust, scale and discolorations from weld areas and to blend welding beads. Seven minutes of blasting replaces 8 hours of hand grinding. Blastmaster barrels (centrifugal blast cleaning) are being used to give good finishes in short times. Extended tumbling can wear sharp corners, but Blastmastering does not act long enough to produce such effects.

Such blasting is also being used to give a surface that will bond better with nickel, chrome and enamel. In this instance, it replaces acid pickling and wire brushing. With the institution of blast barrel cleaning, some parts can be redesigned with large reductions in amount of hand labor required. Hydrogen embrittlement, which can result from pickling, is avoided with blasting and the shot peening effect of the blast actually strengthens the part.

By using an abrasive slurry in a blasting cabinet, as in the Pangborn Hydo-Finish equipment, low-cost finishing of molds for rubber and plastic parts, and conditioning of glass bottle molds to remove heat scale is possible without disturbing tolerances. Better cleaning increases mold life 10 to 15 per cent and final finish is reduced to a few minutes hand polishing with emery cloth covered with oil. Undesirable feather edges are removed but no breakdown of sharp edges and corners occurs.



**Various shapes cold extruded from hot-rolled billets with nominal loss of blank metal. Little if any, supplemental machining is needed.**



**Pigment type inks can be used in this Matthews offset marking unit.**

Burr removal and blending of surface junctures with power brushing machines has resulted in large increases in production. The Brushamatic 3A, developed by The Osborn Mfg. Co., is a semi-automatic brushing unit that quickly finishes gears and other metal parts. Except for loading and unloading, the work cycle of this machine is automatic. Feeding and retraction of the work-holder, and rotation of the brushes follow a preset time cycle. Operation of the machine does not require skill or long training.

It is believed that the primary cause of many of the troubles of well-designed machine parts is stress concentration. When the limit of the material is exceeded, progressive fractures result. A sharp corner or edge may reduce the endurance limit of a part by as much as 50 percent. This reduction in strength is traceable to the concentration of stresses at tool marks, scratches, sharp edges or burrs. Microscopic cracks can start at such points and eventually lead to compelte failure. Brushing blends tool and grinding marks and helps reduce the number of potential starting points for microscopic cracks.

A new concept in circular form-tool sharpening fixtures will be introduced by the Walter H. Brooke Machine Tool Co. Called the Dres-O-Grind, the new tool can be used to sharpen all three sizes of Brown & Sharpe circular form tools, providing, in four, quick, easy setup operations, the proper top rake. It combines a built-in mounted diamond, aligned to the proper height in relation to the tool, and tool-holder setting for predetermined top rake. This means that the operator can take rough cuts, redress for good finish cut and finish grind without resetting the machine.

High efficiency and easy operation are features of the new internal grinding attachment introduced by Royal Oak Tool & Machine Co. It consists of a precision Vulcanaire 65,000 rpm air spindle with Norgren filter and pressure regulator and utilizes regular shop air power. It can be positioned at any angle with easily read machined markings and can be raised or lowered by handwheel. The new attachment, while mounted, in no way interferes with conventional use of the R-O grinder or R-O form relieving fixture with which it is used. The new internal attachments permits grinding smaller cutters by side approach to the work as well as sharpening of trepanning cutters and hollow mills.

Starlite Industries Inc. have developed Magnicon Bond that permits a heavy concentration of diamond powder in a matrix of low ductility, giving great strength and an open structure. This results in cool free, fast cutting and long wheel life. They also have developed a D6WHC diamond wheel for offhand grinding of carbide tools. This type has a heavy concentration of diamond powder, ⅛ greater than possible with other bonds. This heavier concentration is responsible for the shallower depth. The depth of diamond is 0.015 inches. Thus, a diamond wheel is being successfully produced for the smaller shops that want to sharpen and lap carbide tools. This wheel will finish approximately 7000 carbide tools and reduces the wear cost per tool from six cents to 1¼ cents or less.

Precision Grinding Wheel Co., Inc. has a friable aluminum-oxide vitrified wheel with crystalline grain formation. This grain is sharp, cuts cool and free, and holds its shape long. Greater pressures, greater downfeeds and heavier stock removal are required, since, if the wheels are "babied" they tend to load and glaze.

Good results have been obtained in grinding high-speed steels, especially those in the abrasive resistant class of high carbon and vanadium, such as M3, M4, T3, T6 and T13. Results have been equally good on the high-vanadium, high-chrome die steels such as Latrobe BR4. In addition to tool and cutter work, the wheels can be used on surfacing, both straight and segmental, cylindrical, centerless, form grinding and internal work.

## Special-Purpose Equipment and Processes

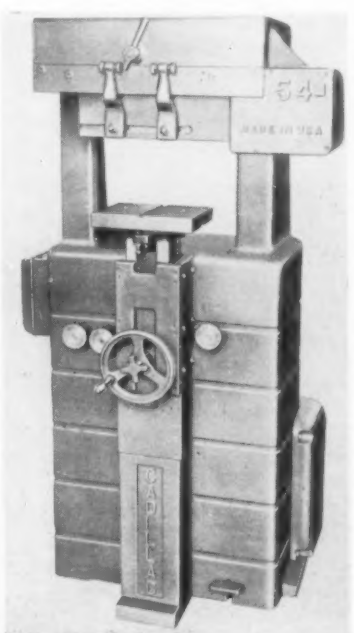
Since it is impossible to separately classify all of the products, equipment and processes to be exhibited, this section will describe valuable equipment but that which is not in sufficient quantity to comprise a separate section. This equipment should not be overlooked because it is "special-purpose." In some applications, these processes are quite standard. Also, where they apply, other equipment cannot do the job.

**Electrical Discharge Machines:** Techniques for machining hard, conductive materials by controlled electrical sparks are being constantly improved and broadened. Machines using electrical discharge principles are capable of doing jobs that could be done in no other way. Energy of an electric spark is used to remove particles of metal from the workpiece. Depending on how it is applied, the process can perform operations similar to conventional cutting off, sawing, turning, milling, hobbing, broaching, drilling, tapping, trepanning and grinding. Hard-to-machine materials, carbides, titanium and high-strength alloys, can be worked without altering the physical properties of the base metal.

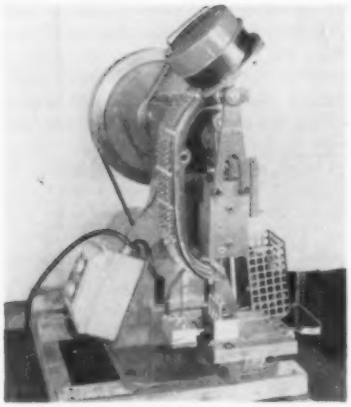
This process stemmed from the undesirable effect of electrode erosion noted during the operation of arc lights. The technique was first positively applied to the extraction of broken drills, taps and other metal tools. Disintegrators of the electro-spark type are still used for such work.

A disintegrator developed by Jiffy Disintegrators, Inc., embodies simplicity and economy. It pulls 120 strokes per second without tubes, rectifiers or condensers, and city water can be used as a coolant. Molybdenum and copper electrodes are used with this machine. Molybdenum electrodes cut somewhat faster.

Disintegrators shown by Electro Arc Sales Co. feature a solenoid-operated spindle with gravity feed to assure steady contact with the work between sparks. In this unit, cutting is done by making and breaking a low-voltage arc between the workpiece and electrode 60 times per second. The arc is made at the positive peak of the sine wave, when current is maximum, giving high distintegrating power. The electrode is on the cold side of the arc and its erosion is minimized. With the addition of this synchronizing circuit, the Electro Arc distintegrator is also useful for positive work. It can form holes of any shape for which an electrode can be made. Greater ease in postioning the head as achieved by mounting the quill on a double cross arm



**Cadillac hydraulic marking machine can be used on hard or soft pieces.**



**Multiple eyelet assembly machine designed by Segal has sliding fixtures and solenoid trip.**

with linear ball-bearing bushings. This machine has a 9-inch stroke with 4 inches of quill always remaining in the housing.

Because this field has advanced so rapidly, many early machines lack the efficiency of the newest models. To up date older models, various conversion kits are available. The Electro Arc conversion kit includes the synchronizing circuit, a new distintegrating head, the 9-inch gravity feed and an eccentric cam impulse coolant pump if desired. Cammann Manufacturing Co., Inc., is making available a discharge power pack that can be applied to and used with standard machine tools such as mills, grinders and lathes. On a lathe, this pack can apply discharge principles to facing, turning and boring. Surfaces are smooth and without burrs. Both hard and soft metals can be cut and, because there is no tool pressure with the process, fragile materials such as foils can be worked.

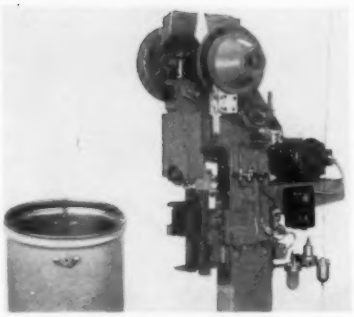
To meet precise requirements of industry and to complement basic discharge machines, Elox Corporation of Michigan is making available new tooling. For example, the Diaform Dresser is used in making precise forms in a brass "grinding" wheel. By tracing a 10 to 1 plastic or sheet metal master, a single-point tool is caused to cut the desired shape in the wheel. Another attachment permits grinding of single point tools to predetermined raddi and relief angles. Operation is entirely automatic.

An Elox wheel-wear compensating kit can be used when large surfaces must be ground. As the brass wheel erodes, the compensating unit automatically feeds the wheel down so that surface accuracies to 0.0001 inch can be obtained. Inside and outside diameters can be ground with an attachment for the tool and cutter grinder or the vertical mill. Workpieces are mounted on centers and revolved while the servo-feed of the basic machine feeds the wheel. Excellent results are achieved in grinding titanium parts in this manner.

Other Elox attachments permit indexing for sharpening milling cutters, convert a standard vertical die sinker to horizontal or vertical grinding, allow tapping holes in solid, hard materials to any thread characteristics and allow accurate positioning when several electrodes are required during production of one hole.

Graduating from simply putting odd-shaped holes through pieces of carbide, electrical discharge machining is going into the varied fields of practical machining problems. Surface finishes of about 10 microinches, RMS, are possible and carbide pieces are entirely free of heat checks and feather edging.

**Controlled Heat:** Development of controlled heat process equipment as machine tools will be illustrated by several exhibits. For example, Selas Corporation of America will operate a high-speed, pusher type furnace for automatic heating of metal slugs prior to hot forming. Automatic feed and delivery as well as automatic temperature control are features. The furnace can heat slugs from $\frac{5}{8}$ to $1\frac{1}{8}$ inches in diameter and from 1 to 2 inches long of brass, plain carbon steel or stainless steel without replacement or adjustment of parts. Delivery rates are a little less than one part every 10 sec. during production runs. Machine brazing and soldering, automatic hardening and annealing, and selective flame hardening equipment will also be exhibited.

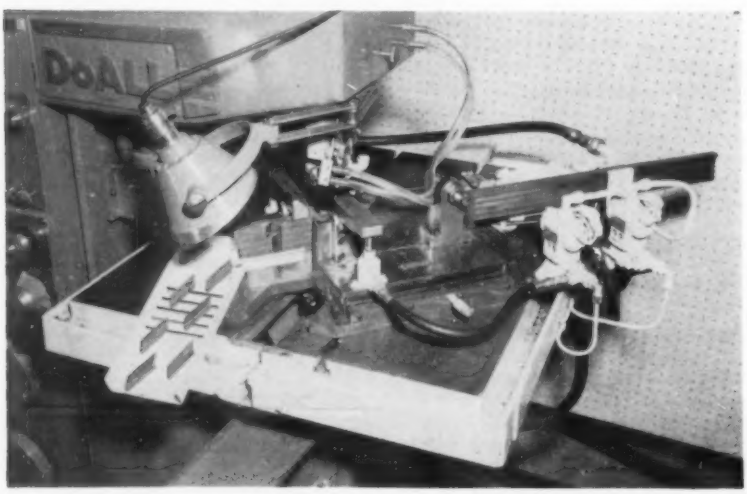


**Bale ears for paint pails are positioned by rivet-pierce method on this T-J machine and sealing process is airtight.**

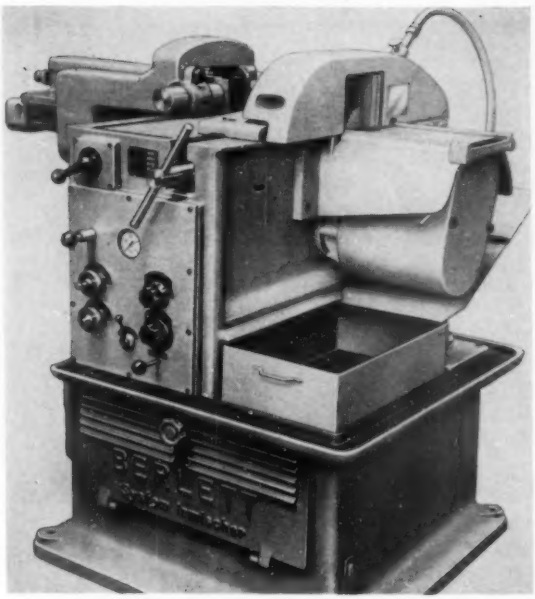
In contrast to gas furnaces, The Sentry Co. will feature an electric steel hardening furnace. Molybdenum high-speed steel tap blanks will be hardened in a special atmosphere to prevent scaling and decarburization. Sample tools presented by visitors can be hardened in this furnace. The Cincinnati Milling Machine Co. has developed an induction hardening machine that operates at frequencies of 1200 to 1400 kc. It will rapidly harden small parts, thin-walled parts, and workpieces requiring a shallow case and a narrow transition zone.

This unit can be equipped for automatic work handling operations. When desired, work and oscillator units can be located directly in a production line while the power supply is several hundred feet away. Because infinitely variable output transformer can be adjusted to compensate for error between coil and part designs, coils can be simply made. Expensive coil forms and stock master dies are unnecessary with this machine. Because of low potential at work coil, operator could hold the workpiece in the coil and actually touch the coil without being injured.

Through application of highly flexible tooling, versatility of the basic Cincinnati Flamatic machine is greatly increased. One machine is being used to harden seven different parts having wide variances in geometry. A single work-holding fixture and two pairs of standard flame heads are changed in minutes to switch from one job to the next. Standard machines are also being used to harden two or three identical parts simultaneously. Automatic operation is resulting from design changes to continuous, fail-safe ignition systems and improved electronic control circuits. Discharge conveyors have been designed so they can be integrated with plant conveyor




**DoAll band machine fixtured for automatic angle cutting.**




**High-efficiency Barlett automatic circular saw.**

systems and integral quenching units have been improved.

**Extruded Shapes:** Production of custom extruded carbon steel sections by the Ugine-Sejournet process has begun at Jones & Laughlin Steel Corp.'s Pittsburgh plant. Initially, the plant will produce extrusions in solid sections ranging in weight from ⅛ to 12 pounds per lineal foot, and up to 24 feet in length. Main production of the plant will consist of complex sections that cannot be rolled, or special small-lot sections for which rolling would be uneconomical.

Many parts now being made from castings, forgings or bar stock can be replaced with substantial savings by hot extruded cold drawn sections. Close tolerance of extruded sections permit use as is. All the fabricator has to do generally is cut the sections to required length. Fabricators can save machining time, machine tool costs, cutter costs and tool maintenance costs.

Billets are heated in an induction heating unit, which is provided with an inert gas atmosphere. When they are heated, billets roll through powdered glass that is picked up and serves as the die lubricant. In the extruding operation, a hydraulic ram positions the hot billet, then pushes it through the die. The extruded bar is cooled, stretcher-straightened and detwisted, and shot blasted to remove glass and scale. To give close dimensional accuracy and fine finish, the bars are cold drawn. Tungsten-chrome steel extrusion dies are used and are shot blasted after each hot extrusion to remove residual lubricant.

Products produced by cold extrusion will be exhibited by Heintz Manufacturing Co. Cold extrusion of artillery shells presaged wide commercial application of the process. Work in the past few years has proved how right early predictions were. Heavy cold forming embodies the use of two types of cold extrusion—forward and backward extrusion—supplemented by conventional cold working operations such as deep drawing, coining, heading and nosing. Carbon and low-alloy steels are used.

Shapes that lend themselves to the process are generally cylindrical; hollow or solid with varying wall thicknesses, flanges, webs and bosses, and can be nosed in at open end in a single operation. Square, hexagon and octagon, as well as gear and spline, shapes on cross sections are feasible. Advantages of the process are minimum loss of material, low amount of finishing required and excellent physical properties of the parts. Typical cold-extruded parts are one-piece seamless hydraulic cylinders and heavy-duty truck gears. For economical application of the process, design should be based on cold-forming methods and runs should be sufficiently long to amortize cost of tooling and press setup.

**Marking Machines:** Since appearance is a factor in both consumer products and production tools, hand stamping of identifying marks and numbers is rapidly being supplanted by machines. A simple machine, built by Geo. T. Schmidt, Inc., uses a hardened dial with 40 characters and an automatic spacing table. The dial is turned to the correct symbol and the operating handle is brought down to impress the character in the workpiece. Impression depth is adjustable and, because of the

**Fully automatic cutoff machine with bar stock feed can make up to 1600 cuts per hour. Further machining is not required on parts cut by this Stone machine because it receives a milled finish.**

automatic spacing, complete uniformity is possible. A hardened anvil prevents wear under the stamping section so plates remain flat. It is impossible for the marking dial to come in contact with the anvil. Dials and associated spacing ratchets can be interchanged in less than two minutes.

More complex Schmidt machines include magazines, stacker feeds and mechanisms for serial numbering. One machine is operated by oil with a pneumatic boost to provide heavy marking in steel flats or rounds. Since both table cylinder and die slide are powdered, operator retains freedom of both hands. Cadillac Stamp Co. has engineered a hydraulic marking machine for high production. Small characters can be pressed in soft, nonferrous alloys or sunk deeply in tool steel. It can be used to mark a wide range of flat, round and odd-shaped products.

Marking thin wall tubes or sleeves can be done easily with The Noble & Westbrook Mfg Co. dial type marking machine. Pressure is applied and a rolling action occurs between marking die and workpiece.

This unit features a continuously rotating mandrel carrier dial, an adjustable die holder head and automatic unloading. Machine loading chute can be filled manually or by hopper. Completely automatic operation is possible. This machine has a safety circuit that causes shutdown if parts are improperly loaded or if the operator comes too close to the die holder head. Speed of the machine is infinitely variable. Offset printing is the basis of the Jas H. Matthews & Co. machine for marking bars, tubes, pipe, noncollapsible hose and heavy wire. It will mark at linear speeds of 300 fpm products from ½ to 6½ inches in diameter. The machine features a synchronized, indirect printing mechanism that transfers ink from a pickup roll to the type face, then to a smooth rubber printing roll that transfers the mark to the workpiece. A dip style fountain permits use of pigment type inks. Rubber printing roll not only prevents wear resulting from type-to-stock contact, but, since it compresses slightly in its center, enables printing of large characters on small-diameter stock. Unit can be driven by pipe friction, special gearmotor or hookup with production machine.

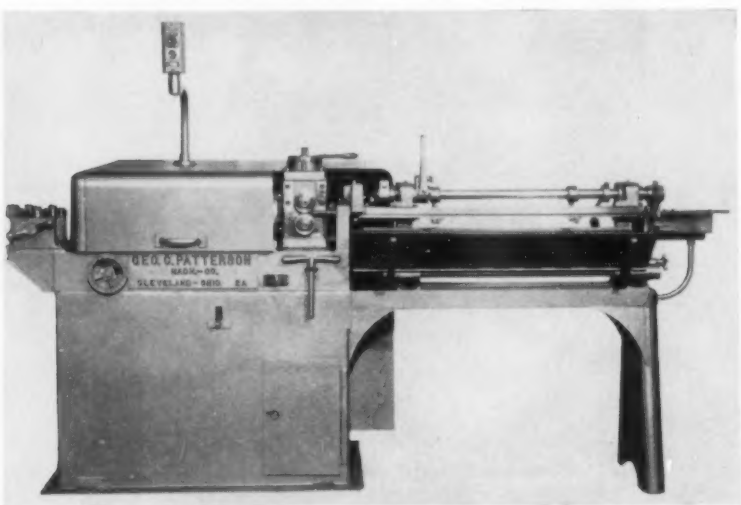
**Microtomatic slicing machine cuts hard materials.**

**Rivet and Eyelet Setting:** Rivet and eyelet setting machines are undergoing basic design changes so they can be included in high-speed processing lines. Tubular Rivet and Stud Co. is meeting the challenge of higher speed with multihead machines capable of automatically feeding and setting six or more rivets simultaneously. Tubular's latest motor-driven bench riveter efficiently feeds and sets rivets with body diameters between 0.098 and 0.036 inch, the smallest rivets now made. Low bench height of this machine reduces transport time and increases productivity.

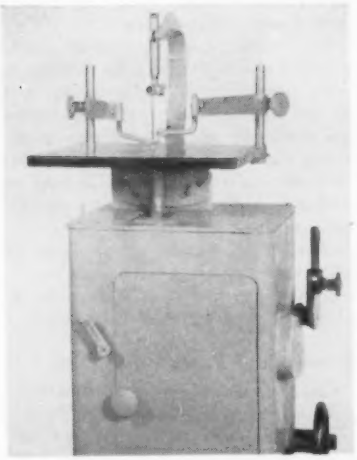
Latest design principles are illustrated in The Tomkins-Johnson Co. special double underfeed riveting machine. It feeds and sets two ⅛ inch diam, 3/16 inch long flathead rivets at a time. In one setup, the machine holds the bale ear for a paint pail in place then, by the rivet-pierce method, forces the rivets through both pieces of metal. Upsetting is done on the outside and the seal is airtight. A new machine, designed by The Milford Rivet & Machine Co., incorporates a toggle setting action. This machine includes a quick-change hopper feed mechanism, a roller clutch and an electric motor drive. Full tubular, semitubular and split rivets can be set and a 12-inch throat gives flexibility in product sizes.

Years ago eyelets were used almost exclusively to receive laces in wearing apparel. Now, eyelets have taken their place as recognized fasteners. In the setting of mulitple eyelets, accuracy is built into the Edward Segal Machinery machine because the setting tools are always in the ram. This ram operates in gibs that assure continuing accuracy. Because of a long stroke and an adjustable horn, there is considerable clearance for special tooling on this machine. It can be used with dial feeds, conveyor feeds, sliding fixtures and other special tooling.

Tool breakage on small diameter eyelets is a big problem in making printed circuits. Segal will show a limited-travel spindle that prevents such breakage. In practice, the conventional spindle strikes the pilot




**Patterson wire straightening and cutoff machine handles range formerly requiring three machines because it handles finer sizes.**



**Heavy-duty die-filer, designed by Rice Pump & Machine, features tilting arbor so work always remains horizontal when filing through 1 plane.**

of the anvil at the time the eyelet is put through the work. When working with small internal diameters, the spindle can be deflected from the pilot and break. With the limited-travel spindle, the spindle is adjusted to stop at a predetermined 0:015 inch above the pilot of the anvil and the eyelet is delivered through the work by the set cap in the ram.

**Sawing and Cutoff:** With the introduction of the high-speed steel saw band, it has been necessary to design machines capable of handling increased loads imposed by the tool. The Contour-matic vertical band machines of The DoAll Co. are being used more and more on production notching, shaping, parting, splitting and angle cutting because they are rugged. Hydraulic feed tables point up the trend toward more automatic operation. Angle cutting of steel rods to produce insert guides for sawing machines is now automatically controlled and demonstrates the production possibilities of modern band machines.

With high-speed steel saw bands, it was a natural move to go into the horizontal band or cutoff machine. The DoAll Power Saw features automatic feed pressure control, automatic band tension and variable tool speed without operator attention. The machine seeks the optimum cutting rate regardless of the type of material or variability in the cross section.

For high efficiency in small automatic operations, the Berlett circular saw, shown by Eric R. Bachmann Co., Inc., chucks the material, feeds the bar and feeds the saw blade, all hydraulically. The machine has a maximum cutoff length of 15¾ inches. The saw blade is sensitive to the cutting pressure and automatically adjusts itself to result in long blade life. The Brehm tube cutter, built by The Steel Products Engineering Co., shears instead of cutting so there is no wasted stock. Edges are left clean and without burrs. Outside tube diameters between ⅜ and 2¼ inches can be handled by cutting heads developed for each size. Cutting edges work inside the tube and are mounted on the forward end of a long support arbor. This arbor feeds the tube to the cutting station where it is sheared by two transverse tool movements. The tube does not rotate and no coolant is required.

An automatic cutoff machine developed by Stone Machinery Co., Inc., combines a fast electropneumatic bar feed with a power stroked cutting head. Work is turned out with a milled finish and requires no further machining. It cuts nonferrous metals at a rate of 2 sec. per square inch using a steeel saw blade with automatic oil mist spray lubrication. The cutting head is engineered with geared-in-head positive drive to deliver all the power to the saw.

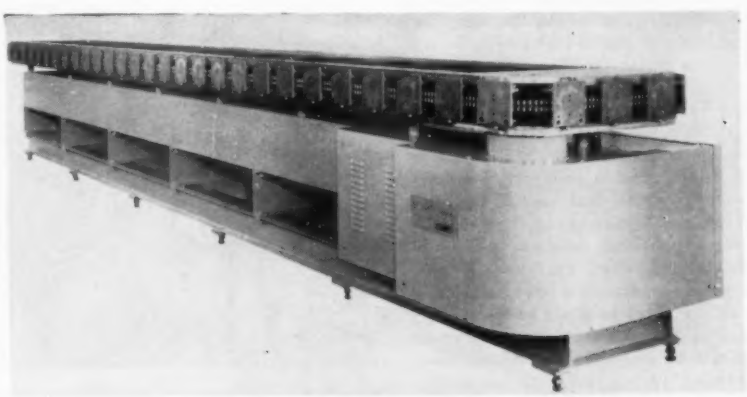
For cutting brittle materials, the DoAll Microtomatic slicing machine gives good results. It is set up on a grinder base that gives good rigidity and positive feed. Slicing and dicing of germanium is readily handled by this machine. Because of manufacturers' needs for greater size ranges in wire straightening and cutoff machines, The Geo. C. Patterson Machine Co. has developed a unit that will handle wires from 16 to 0 gage. Such a range previously required use of three machines. This machine uses a sensitive gaging system (actuated by 3 oz of force on a limit switch) so that finer wires can be handled. The shutter of this machine is mounted directly on the gaging bar on a continuous piano hinge and swings 180 deg to insure discharging cut lengths even at high speeds.

**Machines:** Machine assembly or sequence machining can be done easily by the use of a Kenhos Corp. straight-line transfer machine. Standard 8 and 12-foot sections can be connected for any straight length. End constructions for L, U or O-shape machines enable layout flexibility. Basically, the machine consists of a transfer section that carries subassemblies past work stations. Transfer feed is hydraulic and circuit connections for air and electricity are available at each station. Work area of the machine provides for mounting feeders and processing equipment.

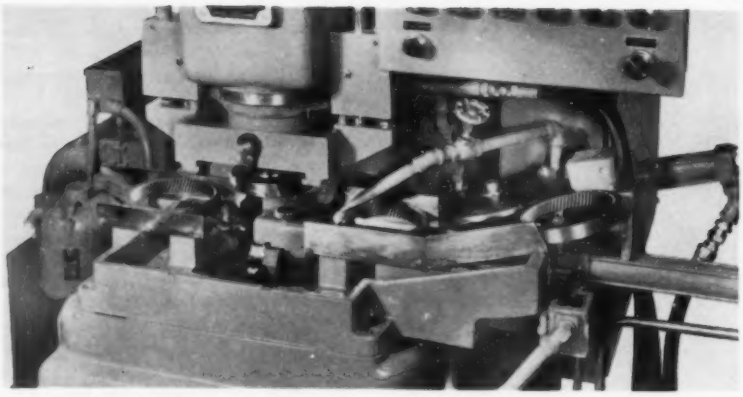
Another straight-line transfer machine has been developed by The Ferguson Machine & Tool Co. The standard machine is 11 feet long and has 40 work stations on each side. Intermittent movement of the parts conveyor is provided by a standard Ferguson drive. The equipment is capable of handling 600 parts per hour. Swanson Tool and Machine Products, Inc. will show a straight-line transfer machine available with 36 to 72 vertical work carriers. Rice Pump & Machine Co. will introduce a heavy-duty floor-mounted die filer. This machine has infinite speed and stroke variation, tilting arbor so the worktable can always be level, and power-driven upper and lower rams.

High-ouput gear chamfering and deburring is possible in every size of shop with Burr-Master machines made by Modern Industrial Engineering Co. Deburring and chamfering both sides of external gears requries no operator attention with an automatic two-station machine. Automatic operations can be completed on internal gears and splines in another machine. A new duplex machine by Modern saves time because deburring and chamfering of both sides can be done at the same time.

Of interest to steel companies and fabricators of bar stock will be a new machine designed for rapid bending of reinforcing bars, smooth rounds and squares, and deformed bar stock of all types. Developed by Pines Engineering Co., Inc., the machine has the capacity for handling up to eight ½-inch steel bars at one time. Speed and angle of bend can be adjusted. The machine is hydraulically powered. A six-ton tube bending press has been designed by Pines to increase production of U-bends not requiring a mandrel. A hydraulically powered ram operates in conjunction with pneumatically cushioned wing dies. Two tubes can be bent at the same time.



**Swanson Auto-Tran straight-line transfer machine provides 36 to 72 vertical work carriers.**



**Single-station Modern deburring and chamfering machine handles internal gears at operating rate of 5 teeth per second in automatic cycle.**

Various special screwdrivers, set up with automatic hopper feeding units, will be shown by The Detroit Power Screwdriver Co. Automatic machines are important in mass production and many automatic loading, unloading and conveying devices are applicable to smaller operations where peak efficiency is just as important. Powered hopper units, when combined with powered screwdrivers, result in high productivity and can be adapted to meet product design changes.

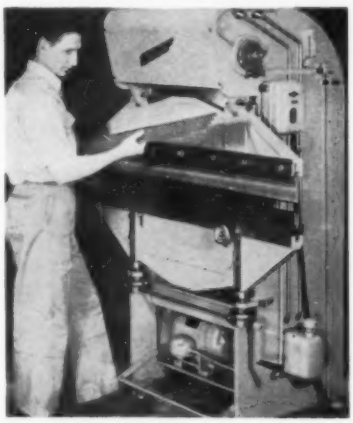
**Stacking Crane:** This crane is the basis for a system devised by Chicago Tramrail Corp. which may well foretell the operation of the future warehouse. This crane is controlled from a desk and can move material in and out of the warehouse with the attention of just one man. Control can be through programs set up on cards or tapes, or by manual pushbuttons. A completely automatic warehouse does not yet exist, but several have been designed. With a crane, material can be stored high and wide and with narrow aisles. All of the necessary motions for automatic movement of material in a warehouse have been successful. It now remains for the motions to be combined in a single system.

**Dust Collectors:** Industry is becoming increasingly conscious of the danger of dust to equipment and to people. For example, a surface grinder without a dust collector may need to be realigned once a year. This could cost $400 plus down time. Torit Manufacturing Co. estimates that one of their unitized dust collectors could reduce realignment to once every five years. Counting original and maintenance costs on collector, savings can be as much as 90 percent. Individual collectors can be located where desired, are flexible for production line changes and can be augmented easily. They can be preset to operate only when the machines they serve are working and thus reduce power requirements while increasing life of automatic equipment. Design trends in this field are toward refinement of after-filtering mechanisms to increase effectiveness, larger capacity in smaller area and quiet operation.

The Pangborn Corp. wet dust collector is a central system that has been designed to cover specific problems. Information will be available on installations where steam and condensate, and hot dust must be removed from work spaces. In this collector, dust-laden air enters through an inlet at the bottom and ascends a tortuous centrifugal path through a fine water spray. The counterflow action removes dust. Clean air passes through a water entrainment section and back into the plant. Dirty water is allowed to settle and then recirculated.

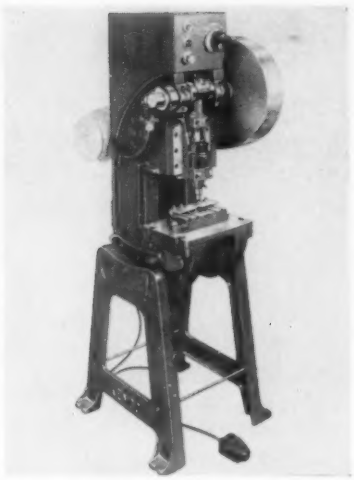
## Presses and Press Equipment

The demand for more production with fewer man-hours has resulted in the development of new equipment that can produce more parts per minute with a minimum of down time. Large mechanical and hydraulic presses have been developed with increased strength and rigidity to withstand higher pressure and more concentrated loads. To accomplish this, more accurate guiding as well as heavier platens and tension members have been employed. Development of controls for flexible cycles has resulted in increased production and more safety for the operator. Still another method of increasing production is with the application of automatic feeding tables and coil cradles. Some operations that formerly required machining are now be-



**Di-Acro Hydra-Power bender used in flat stock forming.**

**A Flexopress used in the manufacture of a coil fin assembly. The fin tube refrigeration coil consisting of copper tubes through aluminum fins is shown in the foreground.**



**Kenco Model 15 Electro-Safe press.**

ing accomplished through a system of complicated dies with increased press pressure.

As recently as 10 years ago, the punch press was number one tool on the industrial high-casualty list. Today, it has dropped to fifth position. A new 15-ton press has been designed by Kenco Mfg. Co. to fill the growing need for foolproof press safety. It also offers high production versatility and low-cost maintenance. Significant Kenco safety advances are: (1) Operator must depress two widely spaced buttons at the same time to single-trip the machine, thus keeping both hands safely occupied. (2) Flywheel eliminated. In single-stroke operation, press and motor go dead after the stroke, preventing stored energy and double-tripping hazards. (3) The selector switch, which sets press for single-trip, continuous and other types of operation, is locked in position by authorized personnel, so that operator cannot devise dangerous shortcuts by varying the setting. (4) Absence of standard clutching operation eliminates loud noise and hazard of mechanical clutching. (5) Press is equipped with a heavy-duty safety brake which will apply at any time the power is disconnected or disrupted. A safety stop button will stop the press instantaneously regardless of the point reached in the cycle.

It is well-known that the punch press does a lot in holding down production costs and now that safety features have been added, it will hold down operational fatalities.

There are now 25 models of Rousselle presses, in 5 to 40-ton sizes, all with the same characteristic operating simplicity and rigid accuracy essential in keeping output uniform and die wear to a minimum. Though essentially designed for heavy metalworking operations, such as stamping, shearing, notching, piercing, forming and bending the accuracy and speed of these presses has made them especially adaptable for handling paper, plastics, fiber and rubber parts as well.

Precision Welder and Flexopress Corp. has designed a Flexopress with high production through high-speed features, such as ball-bearing mounted, low inertia ram, high-accuracy roll feed and rear-to-front material feed. The versatility of such a machine makes it adaptable to semiautomatic or automatic production runs.

In line with the industrial trend toward greater productivity of each unit, the V & O Press Co. has re-evaluated their line of presses and notching machines to anticipate future industry needs. One of the accomplishments was the development of a series of automatic blank feeder and stacking units for No. 410 notching machines. The feeding unit automatically transfers blanks from a stack to the fixture spindle, positions them on the spindle, removes notched blanks and stacks them. The feeding and stacking time, exclusive of the notching operation, is approximately 1¼ seconds.

The unit permits full use of the productive capacity of the notcher and eliminates down time due to operator fatigue and misplacement of blanks. It will not only handle blanks which must be punched and stacked with relation to a keyway or driving hole, but it will also handle blanks without keyways which must be stacked with relation to a slot or driving hole.

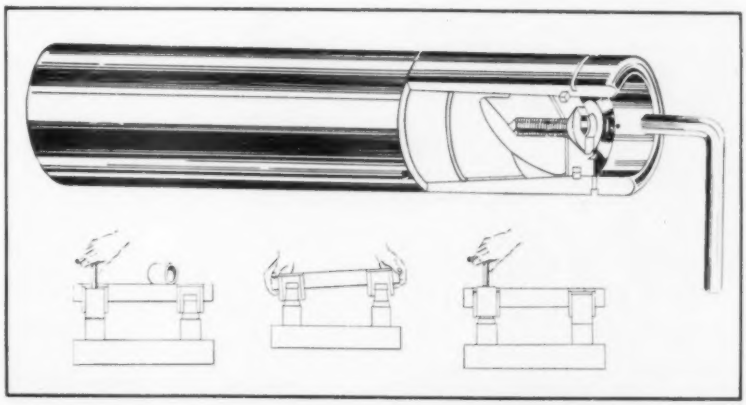
As part of their new look in press design, V & O is adapting the line of straight side presses, previously available for high-speed operations, to normal production speeds. These presses are available up to 300 tons capacity. Press equipment manufacturers are well aware of the demands of the production engineers and are gearing to deliver increased production and longer tool life with the greater automaticity needed to meet tomorrow's industrial requirements.

A new 12-ton, 48-inch, hydraulically operated press brake has been developed by O'Neil-Irwin Mfg. Co. The press brake is designed so that any length of stroke can be secured with a quick adjustment of the stroke control selector, without having to readjust the bed or die settings. Power is obtained through the use of a rotary hydraulic cylinder which is mechanically linked to a camshaft. Trouble-free performance and minimum maintenance results because movement of the ram is entirely controlled by the hydraulic system. There are no brake bands or clutch disks to wear or adjust.

**New Producto master bushing. Note ground shoulders, ground lead on press fit and double figure 8 oil grooves.**

The Precision Detroit Co. Automatic Dial Assembly Press is a pneumatic toggle-action press head mounted on a motor-driven Geneva motion index table. The motor drives the Geneva spindle through a gearbox that makes a cycle for each index and press stroke.

The timing for the press head is taken from the Geneva spindle. The main drive is protected against damage by a spring-loaded pulley. This pulley can slip without upsetting the timing of the mechanism. With the addition of a safety switch ac-



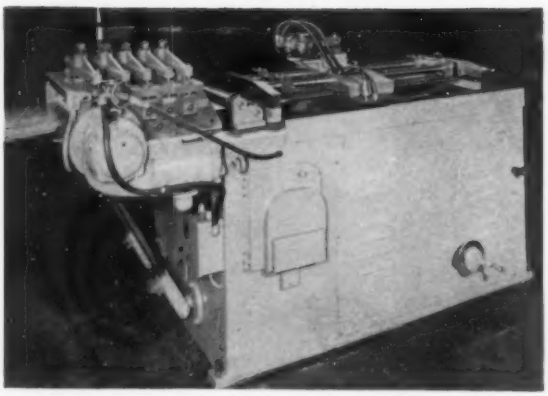
**Recently developed by Superior Steel Products Corp., this removable cap guide pin is for use on die sets that have a tendency to bind when the punch holder is removed. Clearance is provided by removing pin caps.**

cessory, the unit cannot be started unless the air supply is on. The entire index table mechanism runs in an oil bath that provides lubrication for its hardened and ground components.

The press head contains a hardened and ground steel ram in cast-iron ways with an oiler that lubricates the ram and the entire linkage. The air cylinder is lubricated by means of the oiler, filter, regulator and gage assembly. The press head can be supplied in 1-ton, 2-ton, 4-ton and 6-ton sizes. The casting remains the same and it is the cylinder that makes the difference. On the 6-ton size only the cylinder is extended on trunnions beyond the back of the press frame. The press head valve is a simple spool with a bronze body and a stainless steel spool. This valve has five parts, making it possible to control ram speeds without the addition of speed control levers. Air from the cylinder is exhausted through a muffler that prevents the noise usually associated with pneumatic equipment.

Introduced for the first time will be a new 2-ton punch press designed to accept Toolset self-contained punching units, with interchangeable punches and dies, for flexible tooling in short-run punching operations. The setup has a capacity of punching ½ inch thick steel. This press was developed by J. R. Reinertson & Co.

The Brehm Shimmy Die is a trimming die. As its name implies, it operates with a shimmy motion. It is designed to trim drawn pieces, in one stroke of the press, with smooth, burr-free edges and to correct width. By changing adapters, one basic die can trim a great variety of sizes and shapes of shells. Of utmost importance is the fact that the basic die never becomes obsolete. Only the cutting adapters are discarded when any particular shell is abandoned.



**This U.S. slide feed is controlled to stop if stock buckles during feed stroke into press dies.**

A noteworthy development at the Noble & Westbrook Mfg. Co. is the Noblewest Cyclomatic Control which has found wide usage in air presses. This control unit provides for continuous automatic operation of a dial feed air press, that is basically single cycle in operation. In its application, it is possible to vary both "on" time and "off" time; i.e., operating time and loading time. "On" time is varied infinitely as required for the marking operation. "Off" time is similarly variable for time required to load, which can vary with the operator or with the ease of handling the workpiece. Basis of the control is in the flip-flop timer arrangement. Either electronic or electromechanical timers can be used.

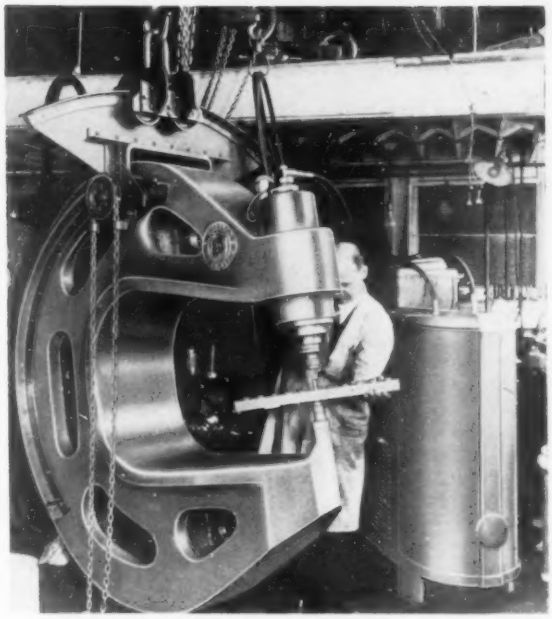
Now guide pins and bushings, engineered to improve die-set accuracy, appearance and performance, have been designed by the Producto Machine Co. The guide pins have been improved with greater press fit lengths, smoother end radii and mirror-like surface finishes of 7-9 microinches, RMS. The master bushings have 5 new design features: New standards for relief, which give greater bearing surfaces and improve accuracy; ground shoulders, which seat bushings square to punch holder and assure alignment; ground lead on press fit, which starts bushing into punch holder with little effort; double figure 8 oil grooves, fed by a grease fitting, provide a constant source of lubrication to pin and bushing (optional spring-loaded grease cups); and tumble-blasting of all unground surfaces, which polishes surfaces normally not finished after hardening.

Danly Machine Specialties, Inc. will introduce a complete new Leadership Line of die sets enabling wide application. Advantages of the new sets include precision-lapped, chrome-plated guideposts as standard equipment for high resistance to wear. Steel shoulder bushings are standard with demountable bushings available as an optional feature. Oil fittings have been positioned in the bushings so they are easily reached from the front or side of the press, and will not interfere with die regrinding or adjustment. Figure 8 oil grooves distribute oil film between guideposts and bushing surfaces.

Removal of punch holder during die-making, die setting and regrinding has been simplified by making one guidepost ½ inch longer than the other (on all standard sets except the floating adapter sets). All four horizontal surfaces, including the top of the punch holder and bottom of the die holder, are ground to a high finish to assure high accuracy in positioning die sets.

The Multi-Roll coil cradle was designed by the U. S. Tool Co., Inc. to meet the re-

**Hansford die handler showing accessibility to the general construction of dies.**



**Portable CP 90-ton hydraulic riveter driving ¾ inch rivets without heating or bucking up.**

quirements of coil stock users. This model is equipped with five coil rest rolls, four driven and one idler. The idler roll is located between two center power-driven rolls. The function of this roll is to prevent small coils from dropping through. This cradle roll will handle material up to 9 inches in width, and coils with outside diameters up to 40 inches and weighing up to 1500 lb. In conjunction with the coil rests, a pair of hardened and ground power-driven take-out rolls unwind the material to the end of the coil. Takeout rolls are mounted on a hinged bracket so that they can be swung to the side to enable the user to load light coils by rolling them into the cradle instead of using a crane or lift. A time delay relay and a precision loop control are also included.

A motor-driven, cabinet-mounted slide feed equipped with an 8-roll plain straightener has recently been developed by the U.S. Tool Co., Inc. This unit can feed stock up to 24 inches wide in feed strokes up to a maximum of 24 inches. An electrically controlled air-operated gripper is mounted in the feed block. The check is so arranged that pilots can be used. Various control arrangements are available for this feed so that it can be tied into operation of single-stroke or continuously running presses.

Necessity of handling heavy dies has prompted the Hansford Mfg. Corp. to design eight different die handlers ranging in size from a small unit handling dies measuring 18 to 24 inches, up to a unit for dies measuring 36 by 72 inches and weighing up to 6000 lb. Most of the models are portable.

Die handlers can be quickly amortized because they save the time of toolmakers. Vertical lift of the top platen makes die separation a fast operation. The revolving top platen assures ready accessibility to the punches and to the general construction of the die. On many of the models, light die tryout can be done. Precise matching of punches and dies can also be accomplished.

## Portable Tools

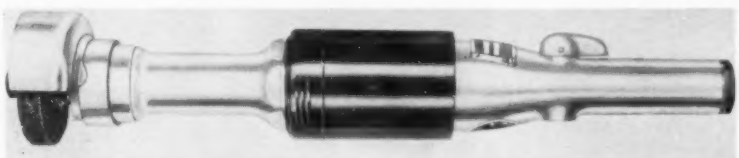
Portable hand tools have a definite place in the production schedule of today. With quick, on-the-spot operation, many hours of material handling and machine setup can be reduced. The trend is toward light, compact units with an increase in power. Most tools have been designed with necessary rigidity, but with simple construction to allow for adding accessories or quickly replacing worn parts. Operations heretofore requiring stationary equipment have been successfully performed on portable tools.

In the past two years, the Chicago Pneumatic Tool Co. has developed tools that indicate trends in industry. Industry's acceptance of hydraulic tools has been based on large-capacity equipment with accurate pressure control and easy one-man operation.

With CP Cold Riveters, there is no time wasted on heating or bucking up. Fewer drift pins are needed to align sections and rivets can be inserted singly or a row at a time. Cold working increases ultimate strength and elastic limit of the rivet metal, and avoids tension or shrinkage due to temperature or scale formation. There are no internal stresses as can occur with welding, and the rivet completely fills the hole, eliminating loosening even with continuous shock loading.

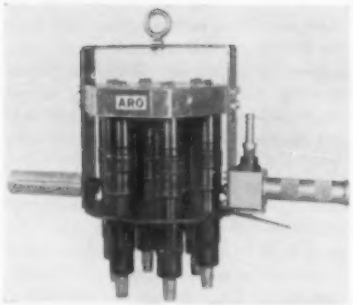
In the hydraulic punch line, a CP lightweight 25-ton hydraulic punch can punch a $\frac{15}{32}$ inch hole in a heavy steel truck frame with just a flick of the operator's finger. Its speed and accuracy increases holes per man-hour, affording clean, uniform holes. CP's portable electric tool line includes numerous models and sizes of Hycycle and Supercycle tools for drilling, reaming, screwdriving, nut running, tapping and stud driving. Others are effective for grinding, sanding, buffing and polishing of finished products. They are fast and increase man-hour productivity. Lightweight tools operate under constant cutting speeds with no chatter under full load. Solid rotors without windings are used. Neither commutator nor brushes are required and there is no armature to burn out.

The new CP air-operated Magnamatic screwdriver-nutrunner line is one of the



**Highly sensitive governor is outstanding feature in redesigned Buckeye X-4 abrasive tools. Horizontal grinder shown holds speed under load.**

**CP portable grinder used in internal operation.**




**Aro multiple spindle screwdriver.**

quietest ever developed. Clutch buzz and ratcheting are practically eliminated. Exhaust noise is muffled by a new baffling principle. The Magnamatic one-shot clutch permits operators on high-production lines to consistently drive as many as 16,000 screws a day without damages to work. The one-shot clutch permits desired torque to be applied consistently over high-production runs without fatigue. Clutch jaw wear and screw bit damage are minimized. Frequent readjustment of clutch jaws is not necessary and torque value remain constant.

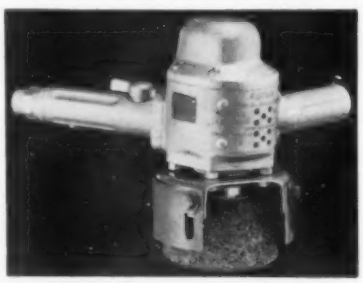
X-4 is the model designation for a complete new line of portable, air-powered abrasive tools developed by Buckeye Tools Corp. This line includes horizontal grinders and buffers, vertical grinders and sanders, and right-angle sanders. Outstanding feature of these tools is a new, highly sensitive governor that enables the tools to develop greater power and to maintain higher speeds under load. Despite the increased power and speed, these tools weigh no more and are no larger than previous models. Present users of Buckeye D, E and F series abrasive tools can obtain improved performance by modifying existing tools.

Special-purpose screwdrivers and nut setters can be designed to specifications by the Aro Equipment Corp. These units may be suspended from a balancer or have a fixed up-and-down traverse on another fixture at a work station. A multiple-spindle tool is usually handled by an operator, but could be integrated into an automatic assembly line. Following the design of other Aro equipment, they are lightweight, sturdy and powerful.

**Rotor drill, 500 rpm., with Heli Coil inserting tool driving ⅛ inch pipe Heli Coils in place.**

In order to provide tools that are easier to use, the Rotor Tool Co. constantly strives to produce grinders with more horsepower per pound of weight. This means a tool with more power, greater production and less operator fatigue. New Rotor models have built-in controls and are adaptable. As an example of adaptability, a standard air drill hs been provided with a special thread insert inserting-tool.

Assembly tools are being revamped to offer more versatility, to suit more applications and to gain wider operator acceptance. This is being done with such features as special exhaust deflectors and silencers, designed for operator comfort and smooth performance. The assembly tools shown by the Rotor Tool Co., have been designed with a high degree of interchangeability of parts to provide simpler maintenance. Designs are simple so that maintenance is minimized. Fewer repair parts have to be kept in stock. These units feature built-in power regulator, built-in oiler, a wide selection of drives for any tightness requirement (for general use or to specific tolerances) plus rugged construction.



**B-7 vertical grinder showing guard on 4 inch wheel with a negative rake. This unit is rated at 8000 rpm.**

The Mall Tool Co. has continued the development of conventional air impact wrenches in ½ and ¾ inch capacities. Also, a ⅞ inch Squatty impact wrench, capable of being used in formerly inaccessible places, has been developed. 1956 will see the introduction of two ⅜ inch heavy-duty impact wrenches, plus a 1-inch capacity impact wrench. A heavy-duty ⅜ inch screwdriver, which is both reversible and nonreversible, and a ⅜ and ½ inch heavy-duty air drill, are new items that have been added to the Mall line.

A new torsion bar torque control Impactool has been developed by Ingersoll-Rand. This is the first application of the torsion bar principle for torque control on nut running. The tools have multiple torque settings that are easily changed with the aid of an adjusting collar and torque jig. The torque action is stopped automatically when the preset torque is reached. Two sizes will be available, 5040T for torques up to 90 lb-ft and a heavy nut running tool, 5340T for torques up to 550 lb-ft. Another new I-R tool is a completely automatic multiple nut runner that assembles

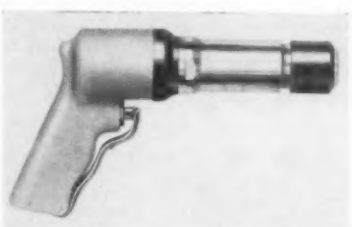
**Ingersoll Rand impact tool showing adjusting collar and torque jig.**

connecting rods, presses in the bolts, feeds the nuts and runs them to a prescribed torque.

The Nelson NS-9 stud welding gun is designed primarily to extend the range of stud diameters which can be welded with a hand tool. Also, it incorporates features which improve the control when welding smaller diameter studs. The Solenoid in the NS-9 gun has been designed to operate independently of the welding current. It has greater lifting power throughout the range of generator settings.

The solenoid is actually two separate coils of magnet wire wound on the same nylon bobbin. One coil is designed specifically for lifting the other for holding. This makes a short-duty cycle lifting coil of high tractive force and a holding coil of relatively low tractive force that will not overheat during the weld cycle. The advantages of this new type coil design are numerous. The solenoid coil design, along with heavier welding cable in the gun, makes it possible to weld the larger diameter studs without overheating the gun. Also, it is possible to run the welding cable directly to the chuck through the gun body and handle. This means only one electrical connection within the gun.

With this solenoid, the stud returns to the plate before the weld contact opens. The advantage of bringing the stud in contact with the work plate before stopping the weld current is that it prevents the molten metal from starting to solidify before the stud is seated in the weld puddle. This is advantageous in the welding of all sizes of studs, but is particularly so with ones of larger diameter. This is accomplished by de-energizing the hold coil slightly ahead of the contractor coil by use of resilient contacts on the control relay. Also, the gun solenoid has a faster drop-out



**Heavy-duty air hammer developed by Superior Pneumatic & Mfg., Inc., weighs only 4 lb. It will strike 2200 blows per minute on 80-psi air and has stroke of 3¼ in. Chuck safely locks.**

**The Nelson NS-9 stud welding gun driving 1 inch studs.**

**Breakdown of Nelson stud welder.**

**Precise power quill mounted on mill arm for production tooling.**

characteristic than the contactor coil.

Arc length can be varied by removing the rear cap and repositioning the adjustable solenoid core. This changes the air gap between the movable and adjustable cores. The handle was located to give balance and was contoured to provide comfort.

The Precise Products Corp. Power Quill unites a powerful high-speed motor with an accurate, rigid spindle and a precision collet chuck. This provides the tool engineer with speeds up to 45,000 rpm and a power output at the chuck of over ½ hp. Small quills can be mounted for production tooling to do the work of far more complicated and expensive capital equipment. Due to its high speed, its high power and its accurate collet chuck, this quill can be used in grinding tools and as a milling spindle for tungsten carbide midget mills. It is possible to finish internal diameters to tolerances well within 0.0001 inch for roundness and straightness of hole, and with surface finishes under 7 microinches, RMS. This can be achieved with one pass of a carbide micromill mounted in the chuck. Frequently, such tools can be used to correct dies without need for annealing. Portable tools have a place in manufacturing today and an even greater potential in metal-cutting tools of tomorrow.

## Equipment Accessories

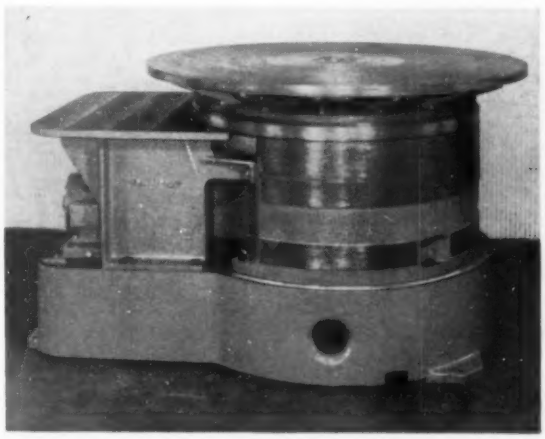
Capable of production speeds of 30,000 indexes per hour, index tables developed by The Ferguson Machine & Tool Co. are driven by a standard Ferguson drive. Its indexing mechanism has an inherent accuracy of 0.001 inch without lock pins. Potential speed of this table is faster than the current tooling that can be associated with it. As individual unit speeds are increased in the future, this table will not prove to be a bottleneck. The Ferguson Vari-Dwell is a standard power section to provide remote control of dwell or to be used with direct drive. This unit synchronizes action of the tooling to table action. A standard power package for straight-line production indexing, the Ferguson Trans-Pac includes an intermittent drive, motor, reducer, clutchbrake, limit switch and couplings.

Production engineers faced with fixed budgets and completion deadlines for tooling programs will be interested in recent trends in indexing equipment. As illustrated by developments of Swanson Tool and Machine Products, Inc., standard machine chassis units are available so the tool engineer can concentrate on the tooling required. Such units provide space for tooling and can be retooled without difficulty. More items are now available with shorter delivery dates. Through indexing units, automatic operations can be introduced gradually.

Both the United States Rubber Co. and the New York Belting & Packing Co. will be exhibiting new applications of timing belts. These belts, with positive-engagement teeth and wire strength elements, are now available for transmitting up to 300 hp. Belt speeds can go as high as 16,000 fpm.

Vibrating parts feeders are becoming more valuable because they can be tied into more types of lines. Gravity feed tracks are being added to the basic units, as evidenced by the Syntron Co. display, so that more control can be exercised. Discharge can be on demand through manual or automatic actuation of a circuit, or can be timed to deliver units periodically. The Vibrolator, shown by Martin Engineering Co., is used to move material in feed troughs. It is quiet, will handle parts of any material and speeds operations. Parts will move steadily without jackknifing, as can happen when endwise pressure is applied on the last piece. Vibrational force and speed of this unit are infinitely variable by adjustment of a needle or globe valve in the air supply line.

When feeding parts, vibration is helpful; in general production, vibration can be a serious problem, and in precision operations, vibration must be prevented. With new vibration mounts it is possible to isolate vibrating machinery, precision equipment or both. Thousands of tiny interlocking stainless steel springs are used in the resilient element of Robinson Aviation, Inc. vibration mounts. Properly designed units using this element offer additional advantages. Shock, vibration and noise of mounted machines are not transmitted



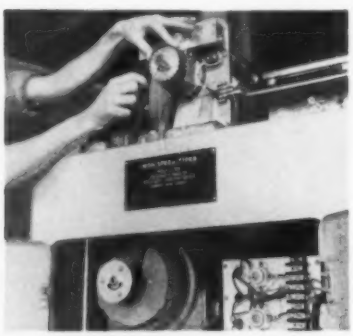
**Standard indexing machines developed by Swanson permit tool engineer to concentrate on tooling program.**

to the building and mounted machines frequently do not have to be bolted to the floor. Layout of production lines can be changed easily if machines are not fastened and maintenance can be simplified by removing a machine to the repair area. Barry Controls Inc. will also show examples of these advantages. Their Barrymounts have been used to permit operation of production machines near to office space and the mounts relieve stresses that might otherwise build up in bolted machines.

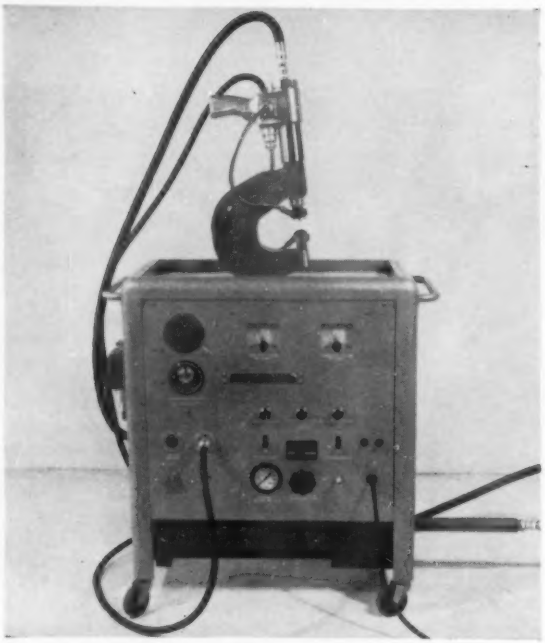
Low coolant levels have frequently introduced production problems. To avoid such problems, Pioneer Pump Div., Detroit Harvester Co., has developed a new pump that functions satisfactorily when fluid level is low. The pump has no metal-to-metal moving parts, is interchangeable with other pumps and can handle liquids polluted with abrasives.

Because transportation of air-oil fog mixtures is easy, Micro-Fog systems have been used to lubricate complete machine tools. Units with capacities for 32, 200, 300 or 1000 bearing-inches have been developed by the C. A. Norgren Co. In an application on a tapping machine, estimated savings were $13,000 and tool life was increased 300 percent. Such units can be applied to existing equipment.

Many machine tools are currently being upgraded or adapted for other uses by addition of precision spindle units. The Standard Electrical Tool Co. will show spindles balanced out to within 0.000020 inch (Vibrometer reading). Such spindles have changed single-purpose machines into high-production, multiple-operation equipment. Pope belt and motor-driven precision spindles will be exhibited by the Federal Machinery Sales Co. These spindles can be applied for grinding, boring and milling.



**Gilmer timing belt by New York Belting provides synchronous drive between mechanical and electronic sections of typewriter capable of 1800 characters per second.**



**Air hydraulic hot dimpling unit by Manco Mfg. Co. provides high thrust at controlled temperature.**

One series of spindles features water-cooled oil mist lubrication and is rated at 100,000 rpm.

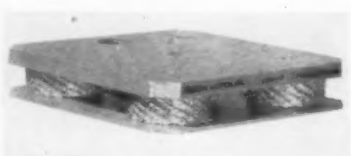
With increasing speeds, closer tolerances and higher work loads, bearings play an important part in successful operation of equipment. A series of thin bearings has been developed by The Kaydon Engineering Corp. to increase the application of bearings. A complete series is available with widths of only ¼ inch. Other problems are solved by a line of flanged bearings that are made to order. Flanges on the races permit mounting directly to the adjoining structure without the necessity of boring the housing. Many of these bearings feature a wire retainer that permits more balls to be used.

Because a lot of work must still be done manually, Aro Equipment Corp. has developed a light ½ ton hoist. One man can install the hoist and use it to simplify lifting jobs. Its rotary-vane air motor gives fast lifts. The rotary vane also acts as a safety device in the event of air failure. The vane acts as a compressor and prevents the load from dropping rapidly.

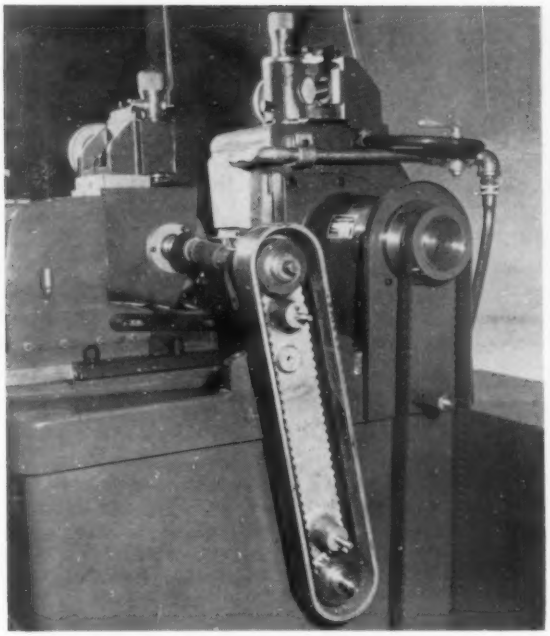
New electrical accessories include a line of short, round-frame flange-mounted motors developed by Century Electric Co. These motors meet requirements for better performance and space saving. In some of the enclosed Century motors, the ventilating fan serves as a rotating seal and provides efficient cooling when operated in either direction. For use in dirty atmospheres, totally enclosed motors with aluminum rotors and skewed laminations have been developed.

The General Purpose Control Dept., General Electric Co., has recently developed a new step-starting accessory for air conditioners. The starter reduces inrush currents by about 50 percent, resulting in lower installation costs. It also allows other motor loads to restart after a temporary power failure. For motors up to 100 hp, General Electric has designed a vertical lift magnetic starter 40 percent smaller than previous models with the same capacity. Strongbox coil design includes a tough cast-on plastic case for maximum protection of coil windings. A permanent air gap causes the starter to drop out when de-energized, regardless of age or usage. Also to be displayed are mechanically held contactors that maintain continuity of sequencing in the event of power interruptions. When power is restored, sequenced operations will resume at the exact point where they were cut off. These units are also quiet because there is no continuously energized coil to hum.

Auxiliary light and magnification is available through use of a Tiny Titan magnetic base. Proper adjustment for both the 5X



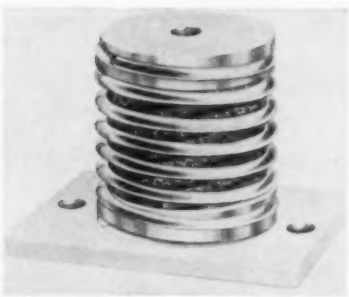
**Small, interlocking stainless steel springs make up the resilient element of Robinson vibration mounts.**



**U.S. PowerGrip timing belt drive applied to a centerless grinder made by Royal Master, Inc. Smooth running drive avoids spindle vibration and enables machine use for finish grinding to close tolerances.**

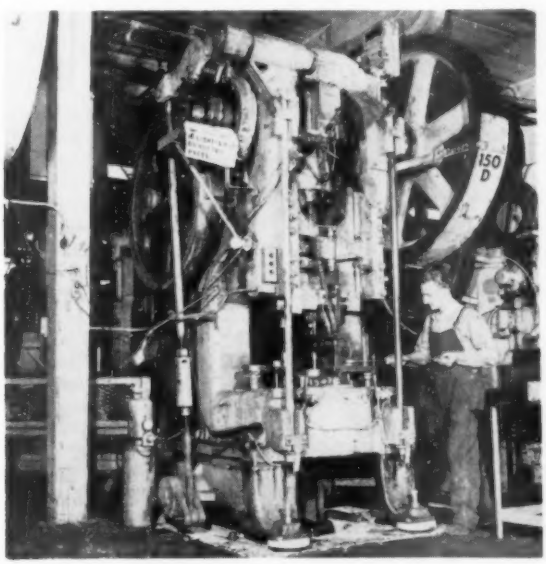
magnifier and the light is possible with this unit developed by Enco Manufacturing Co. Dazor Manufacturing Corp. will exhibit adjustable-arm air-cooled incandescent lamps. An inner aluminum reflector, an outer housing and an unconfined air space between the two prevents the housing from becoming too hot to handle. These lamps can be used at benches or machines.

As competition increases, control of production and inventory is more important. A line of counting and measuring instruments developed by Durant Manufacturing Co. can be used to stop production machines after producing a predetermined number of pieces. A special electric counter can be used to keep track of inventory. Every time a unit is added to stores, one switch is actuated. When a unit is withdrawn, another switch is operated. The number of units in stock is always indicated. Counter and drum indicators can be used on press brakes, lathes, milling machines and other machine tools to indicate location and travel of tools within 0.001 inch. Such units can save setup time.



**Met-L-Flex spring combination used with pumps, fans and compressors has low frequency of two cycles per second.**

In an effort to make available standard parts to cover as many applications as possible, The Bristol Co. is now stocking a full range of dowel pins. They are offered in two standard size ranges, hardened and ground: 0.0002 inch over listed diameter for regular use and 0.001 inch over listed diameter for oversize service. Bristol will also exhibit complete ranges of buttonhead socket screws, socket cap screws and Thru-Broached socket setscrews. The latter fasteners can be hopper fed either end up for automatic assembly operations and can be tightened from either top or bottom of a through hole. Holding power of this design is equal to that of conventional socket setscrews.

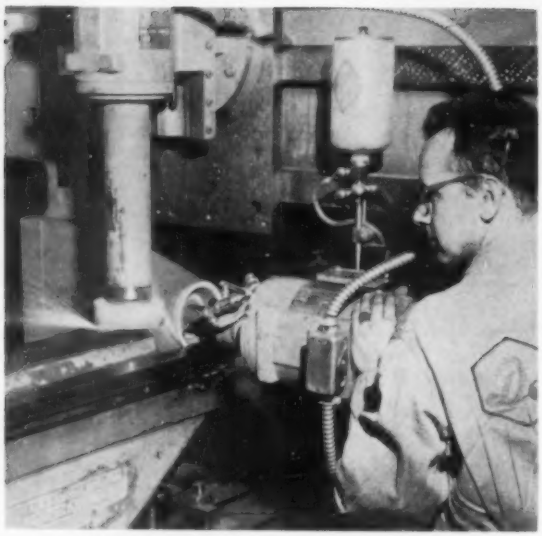


**Barrymounts speed installation of heavy machinery, such as this 35,000-pound press at Worcester Pressed Steel Co., and prevent transmission of shock to disturb nearby precision tools.**

## Hydraulics and Pneumatics

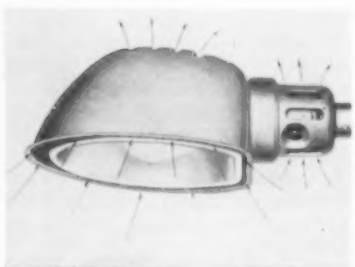
Hydraulic cylinder design has considerably changed in the past few years. The trend is toward smaller more rugged units with pleasing appearance and smooth contours for easy cleaning. Seamless bodies are available in various materials, depending on service pressure. Internal bores of many cylinders are honed for accuracy and extended life. One method of reducing space requirements is illustrated by the Spacemaker cylinders designed by The Tomkins-Johnson Co. No tie-rods are used in these cylinders, strength being obtained from the seamless steel body. Cylinders are available in six mounting styles, all bores 1 through 8 inches and in stroke-length increments of ½ inch.

A complete line of square-steel-head hydraulic cylinders will be shown by Hannifin Corp. Rated at 2000 psi (3000 psi, nonshock), these cylinders fully meet JIC specifications. Another Hannifin cylinder design covers air or hydraulic use to 200 psi. Rods for both these lines are available hardened and with or without hard-chrome



**Standard Electrical spindles, feeds and swivel bases combined to convert planer for grinding bed ways.**

**Pioneer coolant pump can draw when coolant level is low and can handle liquids polluted with abrasives.**



**Dazor air-cooled incandescent lamp shades have double housing to permit circulation of air and prevent burns.**

plating. Cushioned heads for these cylinders feature a springless ball check valve. Cushioned or noncushioned heads can be specified with tube ports meeting the proposed SAE standard. For operation under corrosive conditions, air cylinder internal surfaces can be cadmium plated.

Tie-rodless construction is also featured in National Pneumatic Co., Inc. designs. These cylinders are good for use with air, water or oil without need for changing or adding parts. All cylinders have provision for adjustable cushioning. Noncushioned cylinders can be converted at any time. In this line, piston heads are assembled to single-end-rod and double-end-rod models in exactly the same manner with the same parts. Built-in lubrication lowers initial cost and avoids necessity for constant attention.

Power cylinders with case-hardened chrome-plated piston rods are being exhibited by Miller Fluid Power Co. These units also include Teflon rod wipers and Teflon hydraulic rod seals. Miller is also showing double-acting reciprocating boosters that, with shop air, cycle continuously to supply a constant flow of oil for hydraulic cylinder operation. Miller will show a threaded seal fitting that prevents leaks of oil, air, gas, water and chemical fluids at pipe threads and other threaded connections.

Key to the new Hannifin cylinders is an externally removable and replaceable bronze cartridge gland. The cartridge is relatively long and penetrates into the rod head of the cylinder, assuring alignment. It fastens to a separate gland retainer plate. Locking effect of a resilient O-ring prevents the cartridge from loosening. The ring also seals the pilot bore. The inner seal tightens as pressure increases, and the outer seal wipes the rod dry on the out stroke and prevents introduction of foreign material on the in stroke.

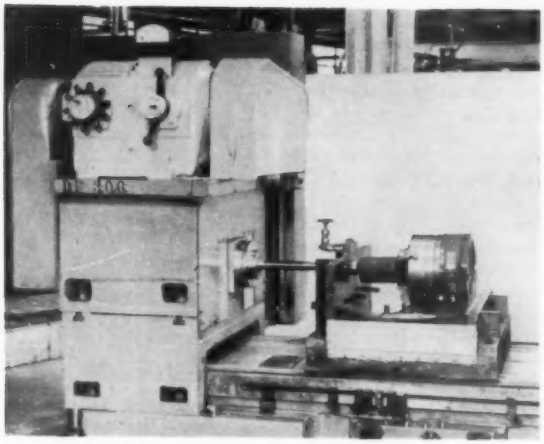
**Short round-frame flange-mounted motors, available from Century Electric in 1 to 15-hp sizes, open or closed.**

A motor of unusual design can be used to oscillate a shaft through 280 deg. Powered by pneumatic or hydraulic pressure acting between a stationary stop and a vane on the movable shaft, this unit can be used to lift, turn, open, close, clamp, index, feed, lock, push or mix. A double vane model, also developed by Roto-Mation Inc., has double the torque without an increase in pressure but travel is limited to 100 deg. Shaft ends come with flat double keyways, splines or provision for Kennedy keys.

Space-saving square-end air cylinders will be shown by The S-P Mfg. Corp. Designed to conform to JIC standards, these cylinders are available in 11 bore sizes from 1½ through 14 inches and with 21 types of mountings. S-P has also developed a new rotating hydraulic cylinder that provides greater force in a smaller area than is possible with an air cylinder. Built in various bore sizes, these units are rated for use with pressures up to 500 psi and at speeds up to 3000 rpm.

Vibrationless and practically noiseless, a new compressor is designed by the Davey Compressor Co. to broaden the application of air. This unit has no reciprocating parts, valves, piston rings, connecting rods or crankshaft. To achieve a convenient source of air, one manufacturer is considering installation of a Hydrovane compressor on the arm of a radial drill. This is only possible because of the freedom from vibration. The compressor delivers a continuous flow of nonpulsating air. An air receiver is only necessary for storage. Delivered air is cool because cooling oil is injected at several stages during compression.

A combination of a National Pneumatic Co. Power Drive cylinder with a Power Check results in the fast economical power inherent in the use of air, and the precise control of hydraulics without the need for pumps, motors, etc., that would be required for a completely hydraulic system. This Power Pack can be attached to production machines by standard foot, flange or pivot mountings.



**Precision boring machine with Gerotor hydraulic transmission now does drilling, rough boring, finish boring and reaming operations.**

A cam-powered self-contained hydraulic unit will be available from the Earl A. Thompson Mfg. Co. This unit can be used to control operation of production machines. It can time, control and operate up to 14 hydraulic cylinders with pressures up to 500 psi. Sequencing is controlled by cams. When cams are designed for harmonic motion, operations can be accomplished in the least time. Up to 10 electrical cams and switches, timed to the pump cams, are provided for control of electrical sequence or safety circuits.

High torque in the low-speed range is possible with the Gerotor May Corp. variable-speed hydraulic transmission. The self-contained unit comprises a driven oil pump and an output oil motor. Probably the most significant feature of this transmission is its ability not only to vary speed, but to produce torque and horsepower over a wide range of values at any given speed setting. Speed range is 0 to 1500 rpm in either direction from a constant-speed constant-direction source.

Output speed can be regulated by controlling the amount of oil displaced by the pump, by controlling the amount of oil consumed by the motor or both. Output speed at constant torque may be regulated by stroking the pump; constant horsepower is achieved through stroking the motor. The output shaft may be stopped by stroking the housing of the pump into a position concentric with the rotor and may be reversed by stroking to the opposite eccentricity.

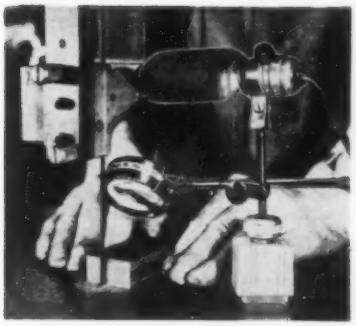
This transmission has been applied to a precision machine originally designed for finish boring operations only. It can now be used for four operations: drill, rough bore, finish bore and ream. Advantages of the setup are: reduced materials handling, all processing in one setup, reduced capital requirements and increased flexibility.

Pneumatic hose supplied by Hofmann Engineering Co. is solid plastic and impervious to oil, gasoline, weak acids and alkalis. It resists abrasion and is lightweight. It will operate over a temperature range of 40 to 120 F with pressures up to 125 psi. Hi-Lo air hose couplings allow high volume of air with low pressure drop. Developed by Aro Equipment Corp., these quick-disconnect couplers have a valve of stainless steel to resist the action of entrained moisture. The neoprene seal is efficient because, when the connector is inserted, it enters part way into the seal.

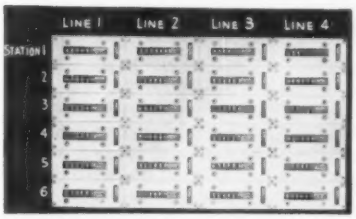
**Valves:** A new series of valves for handling slurries, liquids, dopes and other viscous fluids that might thicken or set up if exposed to air has been developed by The Beckett-Harcum Co. These valves have extra ports so that solvents can be piped through them. Wipe-off and seepage of the fluid is carried off by the solvent, keeping the valve operative over long periods. These valves are remote piloted by air since most applications are for explosive liquids. Rivett Lathe & Grinder Inc. is working on a functional valve design that will, through the medium of interchangeability, provide ready conversion of function. Down time can be saved during change-over because it will not be necessary to install new valves or install new piping. A new Rivett pressure-compensated flow control valve will make available close control for operating equipment.

Through design modifications, all Hannifin Pilot-Master valves test to 10 million cycles or more. Units in this line have solenoids so mounted that they are inoperative when the solenoid cover is removed. The covers are chained to the valve and are held with "captive" screws.

A new packless, rotary disk type, hand-operated valve, the Hannifin Lap Seal, has all four ports on the same plane. Since all ports are in the body, every internal part of the valve is available simply by removing the cover. No pipes need be disconnected. With one type of disk, both cylinder ports are open to exhaust in neutral. With the

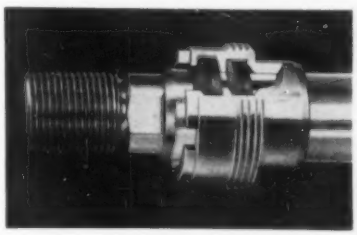


**Tiny Titan magnetic base holds auxiliary light and magnifying glass so sawing operation can be more accurate.**

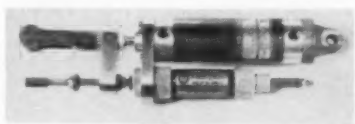



**Remote registration of individual machine production on Durant centralized control board aids in production control with minimum of supervision.**

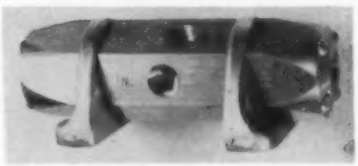
**Tomkins-Johnson tie-rodless construction saves mounting space.**



**Bronze cartridge gland insures clean, dry piston rod for Hannifin cylinders.**



**Combined Power Drive and Power Check results in economy of air with control of hydraulics.**



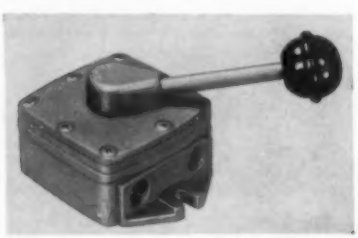
**Valve developed to handle slurries by Beckett-Harcum has extra ports so solvents can be piped through.**

other, both cylinder ports are blocked in neutral so a double-acting cylinder can be stopped in midstroke. Supply air is blocked with both disks when the control lever is in neutral.

Valves for controlling speeds of air and hydraulic cylinders, and for regulating the flow of fluids have been developed by Hanna Engineering Works. These Flo-Set control valves permit forward stroke speeds to be adjusted independently of reverse stroke speed. Aluminum and stainless steel combine to give the valve light weight and durability. The valve is rated at 250 psi for either air or hydraulic service. One revolution of the valve body controls flow from zero to full opening.

Development of a new hydraulic or pneumatic control device has been announced by Carter Controls, Inc. The unit has an internal helix arrangement that converts in-line motion of a hydraulic or pneumatic cylinder into a rotary movement. Its first applications have been in the remote control of valves, where it has been operated by air, gas and hydraulic pressure. It can produce any degree of rotary movement from 0 to 360 deg, greater movement can be obtained by increasing the over-all length of the helix piston rod assembly. The actuator can be made to stop at any rotation point through the use of switching circuits. By using a slip clutch in the unit, many varied rotary sequences can be obtained. Unlimited rotation can thus be achieved with a series of partial rotation cycles.

The Carter actuator is totally enclosed and can be mounted easily. Its hollow piston rod permits lubrication of plug valves through the center of the actuator. Developed for use with lubricated plug valves, the unit may be used for index positioning, control of tumbling cycles, controlled agitation, swing motions and progressive turning cycles on machinery.



**Lap Seal valve has all four ports in same plane.**

## Metal-Cutting Tools

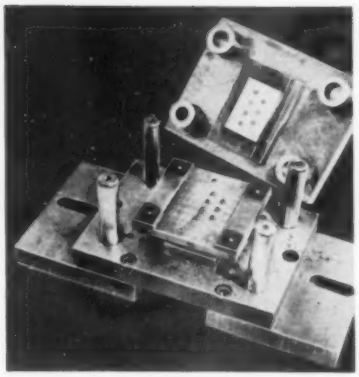
To keep pace with the trend toward higher speeds and feeds in the production machines of today, the tool manufacturer has developed new tools at an ever increasing rate. These tools cut materials that are harder than ever before and can cut the newly developed forms of plastic. They must stand more wear and tear and still be manufactured at lower cost.

High-speed steels made today hardly resemble those of a decade ago. The higher quality of molybdenum high-speed steel and vanadium high-speed steel has caused decreasing use of the older tungsten and cobalt types. Today's super-high-speed steels with high carbon and high vanadium are competitive with cemented carbides as materials for cutting tools. They are tough, strong and not subject to excessive edge chipping and breaking. They now cut longer between grinds and at speeds 15 to 100 percent faster. Tool engineers have been appalled at the cost of tool breakage, not only because of tools consumed but because of down time.

These are important facts for cutting tools but super-high-speed steels are also finding a place in the field of high wear resistant die steels. Recently, several manufacturers of powder metallurgy punches and dies have switched to high-speed steel because of the lower cost and greater toughness. In the case of a large manufacturer of lamination dies, those made from Vasco Supreme (Vanadium Alloys Steel Co.) produced 230,000 parts per grind giving a total life of 10,000,000 parts at a die cost of $2025. This represented a dramatic decrease in cost and increase in production over previously used materials.

The Crucible Steel Co. of America has developed a new processing technique for production of high-speed steels that has resulted in high quality and uniform product. This consistent quality assures reproducibility within every bar from center-to-edge, end-to-end and shipment-to-shipment. High-speed tools can now be made with greater predictable performance. They have more uniform response to heat treatment, size change and service life so vital to efficient tooling for modern processes.

The Carpenter Steel Co. will exhibit samples of and have information on better methods for using tool steels. As an example, they will have information on a punch and die set used to blank dead soft brass washers at 186 strokes per minute, 7 washers per stroke. Since the steel that had been used was far from satisfactory, tooling was switched to Carpenter No. 610 (Air-Wear, 12 percent chromium). Increases in production per grind amount to as much as 500 percent. This is especially significant because 5 hours of production time are lost each time the tools have to be reground.

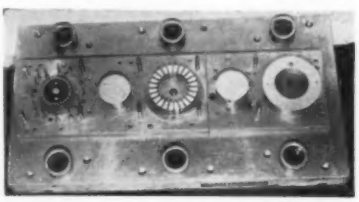


**Carpenter No. 610 used in blanking soft brass washers. Use of this die steel upped production substantially.**

Grinding was formerly required after 50,000 pieces; the 610 tool produces an average of 816,000 pieces per grind. Production with the 610 has been between 100,000 and 288,000 strokes per run. The wide range in the number of strokes is partially due to contract phase completion. The tool was sometimes removed for regrind even though still producing satisfactory parts. By the time it had made 5,500,000, the tool was still good for about 15 more regrinds of 0.003 inch each.

A new concept of core drilling has been developed by Metal Cutting Tools Inc. Called Pin-Mount, it utilizes an improved two-piece construction. Since the shank and socket are separate from the cutting section, the latter has been improved, giving deeper and better formed flutes. These control the chip, provide more chip room and make easier chip disposal. The change in construction means that two-piece core drills as small as ¾ inch in diameter are now available where previously, 1½ inch was the smallest practical size.

The cutting tip may be removed from the holder without taking the tool from the spindle by simply loosening the cap screw. This enables the operator to replace the cutting tips without the necessity of destroying his setup. This is especially important where guide bushings and guide plates are being used. A new flush-fit de-



**Lamination die made from Vasco Supreme by the Eureka-Williams Corporation of Bloomington, Ill.**

**Pin-Mount drill by Metal Cutting Tools has two-piece construction.**

sign does not require a gap between cutter and holder, or a tang slot for drifting the two pieces apart. Drifting is unnecessary because force is not necessary to disengage the cutter from the holder.

This new design lends itself to tungsten carbide tipped core drills where the useful life of a full cutting tool was formerly no greater than the length of the usable carbide. With the Pin-Mount principle, the user now replaces only the cutting tips at just a fraction of solid tool cost. One holder will serve a large quantity of cutting tips.

Made by the Star Cutter Co., Starbore carbide drills produce smooth precision through-holes from the solid in cast iron, aluminum and bronze parts at high production rates. Preliminary work indicates that slight modification of the design can be used in cutting steel. Feeds up to 60 ipm have been obtained in cast iron with these drills. Surface finishes as smooth as 4 microinches, RMS, can be produced in a single drilling operation at feeds of 15 ipm. These drills combine the advantages of an oil flute drill and a trepanning tool. An off-center hole through the drill permits the carbide cutting edges to produce a small pin during the drilling process, thus avoiding zero surface speed cutting edges. This tool holds sharpness, having drilled 2,270 inches of cast iron at 15 ipm with a 7/16 inch diameter drill without sharpening.

Production of a pin also reduces the volume of metal that must be cut. Research has indicated that drills operate at approximately 1/3 the thrust of a conventional twist drill operating under the same conditions. Two or more flutes can be provided in the drill with the two-flute design being standard. The drill can be used on any rigid conventional machine tool capable of producing the desired speeds and feeds. A precision hardened and ground steel or carbide drill bushing should be provided to guide the drill in all applications. No trouble has been encountered in enlarging a previously drilled hole with a modified Starbore drill, even in cases where a bad off-center condition existed. Successful operation of these drills is dependent on a large flow of coolant under considerable pressure.

A new line of Eager Beaver milling cutters has been designed by the Beaver Tool and Engineering Corp. They are furnished with inserted type carbide-tipped blades, secured in place by a plain wedge that permits infinite adjustment of blades. The cutters are designed so that one cutter can be used for cutting all types of material by merely changing to the right carbide blade-insert.

A multiple operation tool developed by The Gairing Tool Co. hollow mills 2 diameters and cross faces a shoulder, while at the same time generating a 60-deg included center in the end of a track roller. The cutting elements used in this tool are standard 3/4 inch triangular carbide inserts, securely clamped. This design reduces setup time and maintenance to a minimum. Except for cleaning the internal mechanism, the head need never be removed from the machine spindle. The resultant savings of this design extend to the tool grinding department, since the carbide inserts need to be ground only on one end.

The setting and adjusting of tool bits for close-tolerance boring has long been a tedious and time-consuming process, usually resulting in high setup time, higher than average discrepant part rate and higher than average scrap rates. Taking this into consideration, the Precision Tool & Mfg. Co. has designed into their Deka-bore boring bar a method for easy adjustment. With this boring bar, the operator has infinite control over the movements of the tool bit.

Accuracy of the adjustment is obtained by a series of ground and lapped, hardened tool-steel eccentrics that are assembled by selective fit and are entirely sealed from dust and dirt. Minute adjustments are made by loosening three screws and rotating a knurled member the required amount. Rapid adjustment in increments of 0.0001 inch diameter and 0.00005 inch radius are possible. Movements can be made in either direction, to increase or decrease diameter, without backlash.

Several recent additions have been made to the line of tools made by The duMont Corp. Minute Man high-speed steel, push type square broaches, starting with a round pilot, are capable of finishing a square hole in a drilled, reamed, cast or bored hole. They may be used in either a hand-operated arbor press or a hydraulic press and are available from stock in eight standard sizes from 3/16 to 3/4 inch square.

Minute Man hexagon broaches, offering the same production advantages as square broaches, are also available in eight standard sizes from 3/16 to 3/4 inch hex. They are particularly beneficial in tool and die work, for sizing work and for hexagonal couplings.

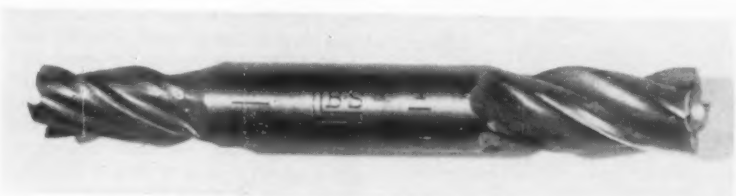
To meet a widespread demand for a keyway broach kit that covers all hole sizes, not only in 1/8 inch but in 1/16 inch increments, the Minute Man No. 1-1A combination kit was recently introduced. This kit provides broaches and bushings for standard width keyways in 18 bore diameters and, by interchanging broaches and bushings, 36 different combinations of keyways can be cut.

Also made available as standard items, are Minute Man production type keyway broaches for fast economical cutting of keyways in quantity. The back of the broach is ground to fit the radius of the bore in which it will cut so that the body of the broach supports itself in the hole, requiring no guide or bushing. Available for 1/8, 3/16 and 1/4 inch keyway widths and body diameters from 1/2 to 1 inch in small increments.

Various types of tools and processes are being used for deburring and chamfering. The Cogsdill BurrAway tool provides a convenient and easy method of removing burrs, fins and other hole irregularities. This tool can remove burrs on both the top and bottom of a hole from one side thus eliminating the necessity of reversing the part. A cutter blade is retained in a slot in the body of the tool. A spring-loaded plunger holds the cutter blade in the open ready-to-cut position. The front or the rear angle of the cutter blade will not function until it contacts either the top or bottom edge of a hole.

Considerable interest is being shown in manufacture and use of thin, factory-ground cemented carbide inserts. The full potential of this development by the carbide industry is yet to be realized by the metalworking industry. Lower costs of machining, less down time, no regrinding, use of harder, more wear-resistant grades of carbide and lower inventories of cutting tools will be possible. Although first used for turning tools, inserts will be applied to other types of cutting tools. Tools such as milling cutters, counterbores, boring bars, spot facers and deburrers will be designed, according to Vascoloy-Ramet Corp.

Implications of this concept are far-reaching. Shops not equipped with grinders and wheels for carbide tools can realize advantages of carbides with inserts. Grind-



**Double end mills developed by Brown & Sharpe Mfg. Co. cut fast. Either two or four-lipped designs, these mills feature different diameters at each end so that only half as many are needed to cover the size range.**

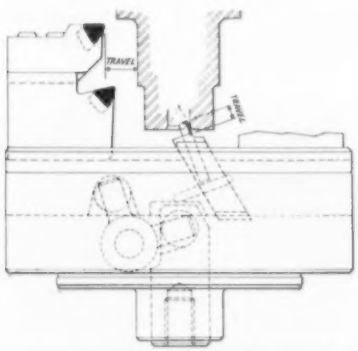
**Starbore carbide drills and pins.**

ing cracks, frequently encountered during resharpening, may be a problem of the past. This trend opens new fields for carbides, and new tool materials, and may establish even greater economies in their use. Lower tool inventories are now practical from both the standpoints of dollars invested and physical volume.

A new face mill using the V-R toolholder principle and throw-away inserts has been developed. It can be used to destruction without ever being reground. Field tests indicate a greater amount of metal removed in a shorter time with a sizeable increase in tool life. When the cutter becomes dull, inserts are indexed to new cutting edges in a matter of moments, and down time is reduced to a fraction of that required to remove and replace a conventional cutter. No setup gaging is necessary.

Due to the demand for insert tooling, Kennametal, Inc. will have a total of 17 tip styles available with a wide choice of nose radii in regular and precision-ground inserts. This greatly expanded line provides tools for use in turret lathes, engine lathes, planers and automatic cycling machines for a broader range of operation. Some of the tools may be adapted to milling machines. Simplified design has effected a high degree of interchangeability in tool hardware. Eight small standard kits of clamps, clamp screws, shims and chip breakers will service all sizes and styles of positive and negative rake toolholders. This is an outstanding advantage where tools are used on continuous cycle operations.

The Stupakoff Ceramic & Mfg. Co. will show its aluminum-oxide (ceramic) based material, Stupalox, developed for cutting tool application. This material is available in all standard size blanks presently used for other cutting materials. Best results have been obtained with negative rakes and large load angles, using mechanical holding devices. These tooling materials mean higher rates of production at lower costs. This is accomplished primarily by the higher speeds used at conventional feeds and depths of cut, resulting in a larger volume of material removed and less down-time on expensive machinery. Other benefits include ease of machining, good finishes, low part distortion and few rejects because less heat is generated in the cutting operation. Used not only for light finishing cuts, Stupalox has successfully machined alloy steels at depths of cut to ¼ inch, feed rates to 0.040 ipr and speeds up to 2000 sfpm. On castings and forgings, good results are obtained in cutting through scale. Entrance cuts on parts that are eccentric can be accomplished easily.




**Gairing multiple-operation tool.**

The most significant aspect of the development of these new oxide cutting tools is the coincidence of their introduction at a time when industry is making new and increased demands for materials to cut harder alloys. These new materials can cut difficult materials, aid in automatic processes, help reduce costs and increase production. They also offer a challenge of their own. Few present-day machines are capable of fully realizing the benefits of oxide tools. In other words, machine rigidity and power must be increased to permit full use of the potential in such tools.

Experimentation by the Engis Equipment Co., in lapping of tungsten carbide cutting tools with diamond compounds has resulted in permissible increases from 100 to 300 percent in spindle speeds, feeds and pieces per grind. Special tool-lapping devices and techniques together with "job engineered" diamond compounds promise even greater improvement in performance of carbide and ceramic tools, contributing thereby to the speed and reliability of many automated machining operations.

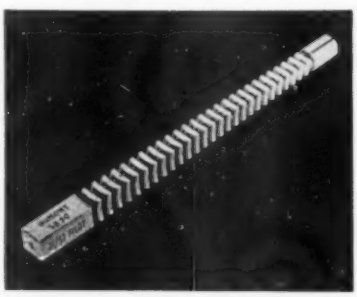
Until about two years ago, high-speed steel was unavailable in the strip form required for making saw bands. No way had been found to heat treat the metal so that the teeth would have a hardness of high-speed steel tools while the band body had the flexibility necessary to travel around the wheels of the band sawing machine. Also, a way had to be found for welding high-speed steel so that the weld could take repeated flexing. The DoAll Co. has introduced the Demon high-speed band which has proved quite satisfactory. This development brought to metal band sawing all the advantages that high-speed steel cutting tools had previously brought to other machine tools. It greatly increased cutting rates and tool life, and augmented the natural advantages of band sawing. These bands are being used in contour and cutoff sawing.

**Model A-2P Deka-Bore boring bar with one of eight quills.**

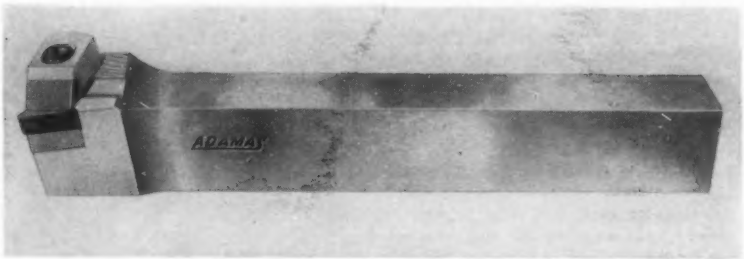
A complete new line of power and hand hacksaw blades, has been developed and production-proved by the L. S. Starrett Co. Each of the three types of blades has special characteristics for faster, easier cutting and longer blade life on a wide range of cutting assignments. They are distinctively color-identified and have easy-to-remember trade names. The Starrett "Redstripe" SM special alloy high-speed steel power and hand blades combine new developments in heat treating with the long-wearing qualities of special high-speed steel. They are especially tempered for extra toughness and high-speed cutting of hard materials with heavier speeds and feeds.

Starrett "Greenstripe Safeflex" welded-edge power blades and hard-edge flexible-back hand blades are double welded to make them shatterproof, safer, straighter cutting and longer lasting. They are particularly recommended for tough alloy steels, multiple cutting or interrupted cuts.

"Bluestripe" selected high-speed steel power and hand blades are especially heat treated for high-speed production sawing of hard-to-cut metals such as alloy steel, stainless steel, phosphor bronze, tool steel, rails, chrome steel, Monel metal, etc. These blades are also recommended for general-purpose cutting because one pitch of teeth



**Minute Man broach by the duMont Co**




**Anvils on the Dex-A-Tool holder are screwed directly onto the shank so it cannot become separated from holder during indexing or changing.**

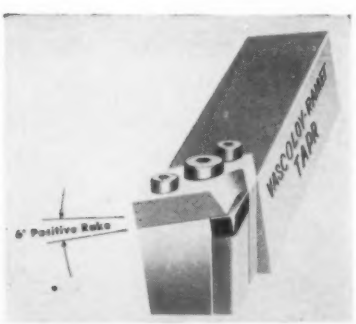
will cut a wider range of metals.

Another new item in the Starrett line is a shatterproof, heavy-duty hole saw, designed to cut clean, round holes from ⅝ through 4½ inches in diameter in any machinable material up to 1⅛ inch thick. This includes steel, brass, bronze, cast iron, aluminum, wood, plastics and sheet steel, and cast iron and steel pipe.

They are particularly recommended for use with portable power tools with ½ inch or larger chucks and on machine tools such as lathes, drill presses and radial drills. Double welding combines a high-speed steel cutting edge with a tough, shatterproof body that is welded to a rigid steel cap, threaded to accommodate interchangeable arbors. Arbors are available with ½ inch or ¾ inch hexagon shanks and also with a ¾ inch round shank. A ¼ inch high-speed steel pilot drill is incorporated in each arbor.

A new center punch developed by The L. S. Starrett Co. features a lightweight aluminum handle for effortless handling plus an automatic striking mechanism with adjustable striking force. No hammer is needed to use this center punch. The handle is pressed and a built-in mechanism strikes a perfect center mark. A similar punch is available for centering countersunk holes.

Armour Research Foundation will show a model of the first nuclear reactor designed for private industrial research. The reactor will be built by North American Aviation, Inc. The new industrial research reactor will be used entirely for nonmilitary application of atomic energy. Radioisotopes for industrial, medical and scientific research will be available from the new equipment. Short-lived isotopes have not been widely used because of the time delay and resultant radioactivity loss if moved over long distances. The reactor will be capable of operating at a power level of 50,000 watts. Completion of the reactor is expected in April, 1956.




**Carbide insert in VR toolholder.**

## Toolholders

A really flat surface on which the tool bit can rest is the first essential if good results are to be obtained in machining operations. The second requirement is an efficient clamp. Both requirements are met by the Eclipse toolholder developed by James Neill & Co., Ltd. The bit groove is carefully machined with relieved corners. It is open and can be cleaned easily. The clamp plate applies both downward and sideward pressure on the tool bit.

Throw-away carbide inserts are now firmly established in the tooling field. Various designs of holders are available so that such tools can be applied, with savings, to jobs where they could not previously be used. Most designs include separate adjustable chip breakers, to reduce grinding requirements, and methods of fastening parts so holders can be used in any position. Insert indexing or replacement from either top or bottom can be easily accomplished because clamp screws are frequently double headed. Valenite Metals Corp. holders include a pin that fastens the chip breaker to the clamp. Multicut toolholders by Wesson Co. have extreme front and side clearance angles to increase utility.

Carbide or copper plate, hardened tool-steel anvils are screwed directly to the shank of the Adamas Carbide Corp. Dex-A-Tool. These anvils are indexable and invertible. Anvils are available in two thicknesses to accommodate standard ⅛ or 3/16 inch thick inserts. New Vascoloy-Ramet Corp. insert holders have minimum head size to permit grouping of tools. Also to be shown, are new V-R 6-deg positive rake holders for throw-away inserts and a 6-deg positive rake holder for use with square inserts at a 15-deg lead angle. A 6-deg positive rake toolholder for facing cuts will soon be available.

A new circular form-tool holder, in which optically ground carbide inserts are mechanically clamped, is being shown by the Arthur A. Crafts Co., Inc. The low-cost alloy steel body is repeatedly used for holding tips with various contours. Added backup for the insert is obtained by grinding a special steel form for each contour of insert. Loads can thus be transmitted to the body without extreme changes in section.

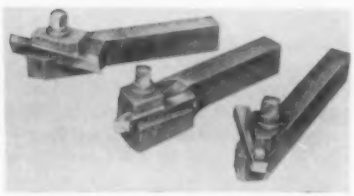
The Jay-Dee toolholder is a combination of torque tap driver and quick-change chuck. It requires no adjustment for driving different sizes of taps. The unit can be used to drill and tap two different sizes of holes by using two drill collets and two tap collets, with the Jay-Dee acting as a quick-change chuck. Since the torque driving arangement is in the attachment, it is possible to drill a hole, remove the drill collet, insert a tap collet and tap the hole. Torque can be changed easily and blind holes offer no problems.

A floating toolholder for tapping operations will be shown by the Thread-All Co. All dead spots and load-friction areas have been prevented by applying the load to 18 high-accuracy balls in a ground race. By the use of two oscillating members with sliding ball races at 60 deg to each other, the holder can be guided off center with minimum pressure. A tension ring has been added so the unit can be used for reaming.

A tooling system built around a standard range of multipurpose single-point adjustable tools will be exhibited by The DeVlieg Microbore Co. This Flash-Change system can be used in all types of boring and milling machines. Boring bars and adapters are located radially in the toolholders by means of driving keys. This insures accurate repositioning of tools. Cutting dimensions can be precisely located through verniers built into the toolholder.

Drill press production can be speeded

**Starrett welded-edge hole saw.**



**Neill toolholders have clamp plates that apply pressure both downward and sideward on tool bit.**

through use of American Machine & Foundry Wahlstrom automatic chucks and tapping attachments. Drills can be changed instantly without stopping the spindle. Specially designed grips hold the drills and will not damage them in any way. Drill alignment is accurate to 0.004 inch.

In the case of damage or design changes, only the bar need be replaced on a built-up boring quill developed by Briney Manufacturing Co. This unit consists of a bushing mounted on preloaded ball bearings between the flange and boring bar. The boring bar is driven by a flange that is locked to the bar by an integral pin and locknut unit. Inertia and spring tension on the bushing prevent slippage when starting or stopping the quill. Rapid tool adjustment is accomplished by rotating the bushing with a spanner wrench. This moves the bar, mounted in an eccentric hole, in a slight arc. Adjustment covers a vertical range.

## Work-Holding Devices

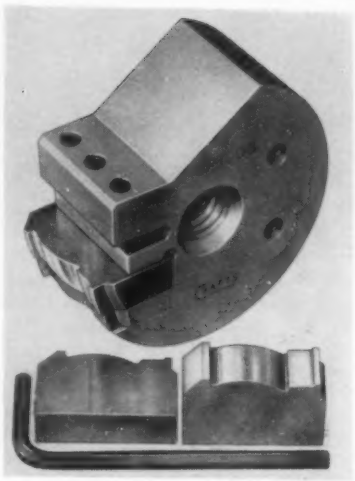
Production parts frequently require the design of new work-holding devices. The extra pressure applied by the higher speed and more powerful machines of today necessitate stronger and more accurate holding of parts. Closer tolerances must be kept. Safety to the operator must be considered. Work-holders must fit into a multitude of operations: job shop, semi-production, or automatic.

The Cushman Accra-Set chuck has been designed for work that must be held to closer limits than is possible with the standard scroll type chuck. Adjustment is simple and quick, and the chuck will repeat to 0.0005 inch, or better, total indicator reading. Because of its accuracy and jaw capacity, the Accra-Set chuck can replace even the most accurate collet chuck and its necessary range of collets.

The adjusting mechanism of the Accra-Set chuck consists of four adjusting screws equally spaced about the periphery of the chuck body and placed on a compound angle. The screws always make full end face contact with hardened steel balls, which have one flat plane, and which are free to find their own pivotal position in the rigidly mounted back plate of the chuck. Adjustment of the screws against the balls easily shifts the chuck body carrying the jaws, scroll, and pinion to dead center, and at the same time, draws the body solidly against the back plate, as well as positively locking it against rotational slippage.

Accra-Set chucks, ideal for precision bar work, are available with 3 or 6 jaws in 6, 8 and 10-inch sizes. These chucks are furnished with a straight recess back and require adapter plates for spindle mounting.

The Cushman Chuck Co. has expanded its manually operated chuck line by adding a 3-jaw, scroll operated, compensating chuck. Design of this chuck provides an appreciable amount of compensation and permits gripping of irregularly shaped workpieces which have been previously



**Circular form toolholder by Craft has alloy steel body and holds inserts ground to correct contour.**

centered by some other medium than the chuck.

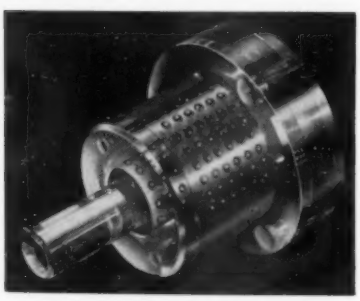
Jaw compensation is achieved by means of a two-piece scroll, the lower half of which is engaged by the pinion and is concentrically located at all times by the chuck hub. Clearance provided in the chuck body permits the upper jaw, controlling half of the scroll, to float, thus providing the compensating feature. A drive plug, located on the lower scroll section, loosely fits into the upper scroll section.

Due to the specific problems encountered with each type of workpiece requiring compensation, the chucks will be manufactured on request.

Advanced design of the new Cushman air-operated compensating chuck offers the user two chucking advantages. Not only does this chuck offer compensating action but by "locking-out" the compensating action and after being trued up on a spindle, this work-holding device can be used as an ordinary self-centering air-operated chuck.

Compensating action is accomplished by means of a lever cage, free to float in any direction, into which are pinned the jaw-operating levers. Controlling or locking-out compensation is achieved through the use of three adjusting screws located in the

**Flash-Change toolholder system insures accurate positioning of tools.**



**Briney built-up boring mill.**

**Cushman three-jaw scroll operated compensating chuck.**

periphery of the chuck body. These screws, depending upon how they are set, either permit or prevent lever cage motion, creating controlled compensation or self-centering chuck operation.

Horton Chuck has designed a new centering device to be incorporated in their line of J-type chucks used in machining jet engine parts. This new controlled centering pressure chuck has the advantage of being able to center, at a preset centering pressure, thin-walled rings and parts without distortion. Three universal jaws are moved in toward the workpiece and stop automatically when the piece is centered and all 3 jaws make contact. Twelve independent jaws are then moved in to pinch the part in its position. This adjustable centering pressure feature saves considerable mounting and centering time and completely eliminates the possibility of distortion to the part due to excess pressure applied by the operator. One of the newest design features incorporated in this centering device is the complete and automatic sealing of all jaw ways against chips, regardless of jaw position.

Pioneer Tool Engineering, Inc. will exhibit the Octopus Grip vacuum chuck designed by Convair. This chuck is fabricated from 921-T, which is a specially alloyed cast aluminum tooling material that is stable under most temperature conditions. The chuck is used to hold parts during the milling of complex shapes. Suction cups, used to hold the workpiece on the chuck, use removable rubber grommets. A screw in the center hole of each cup serves as a shut off valve. This allows any shaped skin to be placed on the chuck without complicated sealing requirements.

Builders of air-actuated work-holding devices, Production Devices Inc. has designed the Airlox Pneumatic Vise particularly for stationary work holding on machine tools. An air-operated wedge-with-levers mechanism enables these vises to continuously grip the work. In all Senior vises, the cylinder and mechanism are enclosed within the vise body. Most models are equipped with chip plates and felts, which reduce vise cleaning time. Vise maintenance is negligible, and normal shop air pressure is usually adequate for satisfactory performance.

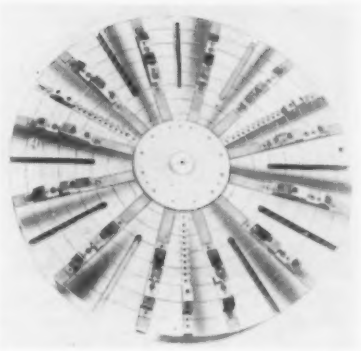
One notable advancement is that all Senior vises are now equipped with an exclusive Airlox grease system in the movable jaw. Each application of grease lubricates the jaw completely and at the same time pushes out fine chips or foreign matter from under the jaw.

These vises are exceptionally suited for work holding where carbide cutters are used in milling. Up to 10-ton grips are available from various Airlox Senior vise models using standard 100-lb air lines.

Heinrich Tools, Inc. has applied the Circle-Grip locking mechanism to the new No. 12WH band saw vise. It has a capacity of 12½ inches and the workpiece is locked securely by a light press of the locking lever. Hardened and ground bar and locking mechanism insures long life. Guide bar prevents damage to saw blades from contact with hardened bar. Removable shoulder screws are provided for automatic chain feed operation.

Another new Heinrich tool is a drill press vise, No. 13WH. It has a capacity of 6 inches. This vise with table mounting attachment fits any style of drill press and does away with bothersome clamps, straps and adapters.

MilOmatic air-powered hydraulic vises, manufactured by Wilton Tool Mfg. Co., Inc., combine instant action with a 9000-lb hydraulic locking force. This combination eliminates the mushiness of straight air under impact and the pumping (and leakage tendency) of plain hydraulic vises. The air-hydraulic booster is connected to the vise by a flexible hose. It can be mounted

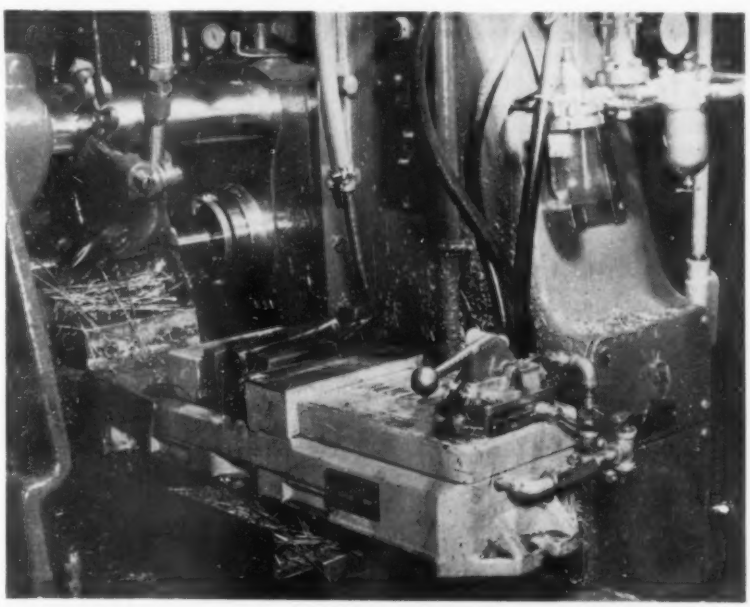


**Horton controlled centering chuck.**

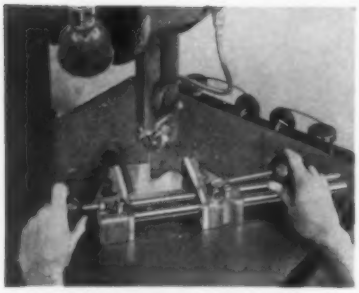
on the machine base or floor, permitting the use of multiple setups the full length of the machine table. By replacing the steel jaw inserts with jigs or specially shaped jaws the MilOmatic can be used as an automatic fixture.

The American Machine and Foundry Float-Lock instant-change safety vise can increase drill press production due to the fast acting jaws that slide quickly to the desired position. It can be used as a drill jig, eliminating approximately 70 or 80 percent of parts normally used in drill jigs. A special safety model for band saw use has two handles for full control and gives positive protection for the operator.

A new type milling machine vise has been developed by the Illinois Metal Products Co. It has a hold-down feature for clamping work downward as well as laterally. This vise does not require parallels, loose improvised hold-down bars or ham-



**Airlox model S-7 pneumatic vise mounted on a horizontal milling machine. Machine has been completed on the workpiece in the vise on the left-hand side of the table while the work is being loaded in the vise on the right side of the table.**



**Heinrich's No. 12WH band saw vise showing curve in block. Hands are clear of saw blade for safe operation.**

mering and it speeds vise setup time.

Counters or heels of the jaws are seated in a 4-deg dovetail on either side, accounting for the high holding pressure applied to the jaws. The heel of each jaw rests on four spring-loaded buttons which hold the clamping surface of the jaw 1/32 inch above the bottom surface of the vise when in an open position. It requires approximately 100-lb pressure to deflect the jaws laterally. As the vise is tightened, these jaws continue to hold that pressure and direct it downward, positioning the workpiece on the floor of the vise. The clamping screw of this vise is half recessed into the base and on a direct line with the clamping position of the hold-down jaws. This construction eliminates springing or buckling of the base. The jaws may be rotated back 180 deg for rapid cleaning.

The Eclipse composite Vee-Vise, made by James Neill & Co., is a dual-purpose tool. It can be used as a toolmaker's vise with a capacity of three inches or as a hardened and ground V-block complete with sliding clamp. Two interchangeable sliding vise jaws of different lengths, and two ground parallels enable holes to be drilled through material held in the vise.

A new approach to collet chucking has been announced by the N. A. Woodworth Co. Called Tork-lok, the design uses inclined flats in both collet sleeve and arbor shaft to avoid clearances inherent in a cone design. Positive drive is guaranteed through these mated flats. Built-in safety stops control both expansion and contraction. Overexpansion is impossible, reducing collet breakage. Contraction is restricted to maintain a preload which assures a metal-to-metal seal excluding dirt and chips. The collet is made in three styles: between centers, flange mounted drawbar and air-operated drawbar.

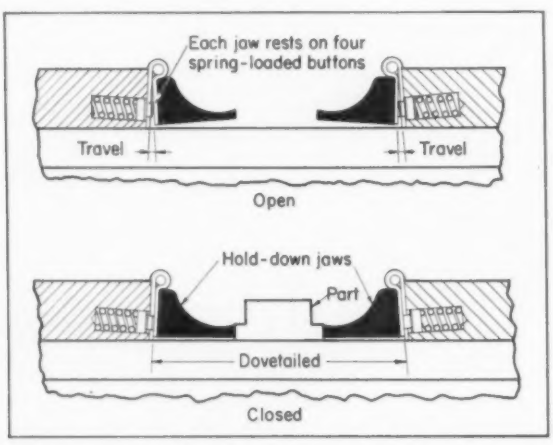
Considerable setup time and expense can be saved in turning and grinding operations by using the Motor-Tool live center with an overload indicator and the Zee-Hawk driving center. The live center takes care of pressure in two ways: when teeth of driver bite into end of shaft and when work elongation results from heat. The driving center engages teeth of a specially designed driver plate in the work. This permits a tool or grinder to finish a shaft in one cut with closer tolerances and less scrap. Both units were developed by J. R. Reinertson & Co.

A new type of center called Grip-Tip has been designed by Detroit Reamer and Tool Co. This center consists of a holder and replaceable carbide tip. The holder is made of tool steel and is available in several standard Brown & Sharpe, Morse and Jarno shank tapers. The solid carbide tips are available in 1/4 and 1/2 inch diameters and are accurate to 0.0003 inch.

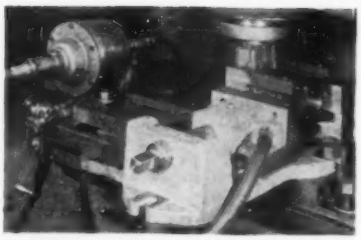
Male or female carbide tips are inserted or removed from holders by simply turning a screw. An adjustable screw in the shank of holders positions depth of carbide tips.

Erickson speed indexers have been further improved so that they can be easily adapted to automatic processes. The housing has been changed to accommodate limit switches. Also, a pneumatic bar feed is used in conjunction with the Erickson air cylinder to operate the collet-closing mechanism, converting a turret lathe to semi-automatic operation.

The Erickson Master Spacer accurately positions work for a wide variety of ma-




**Drawing showing operation of the Illinois Metal Products' new vise.**



**MilOmatic air powered hydraulic vise. The control is mounted directly below air booster at left of picture.**

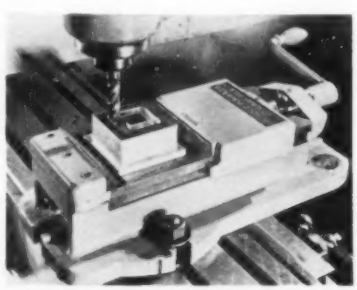
chining operations. Timkin bearings are used for accuracy and rigidity. When unclamped, the bearings allow the work to be trued in relation to the centerline of the workpiece. The spacer comes equipped with a precision 6-inch 3-jaw chuck.

Recently, Lodding, Inc. began production on a new line of work holding, retracting clamps. Air is employed in one style, resulting in rapid action. Since the clamp is self-retracting, it is adaptable to all types of work.

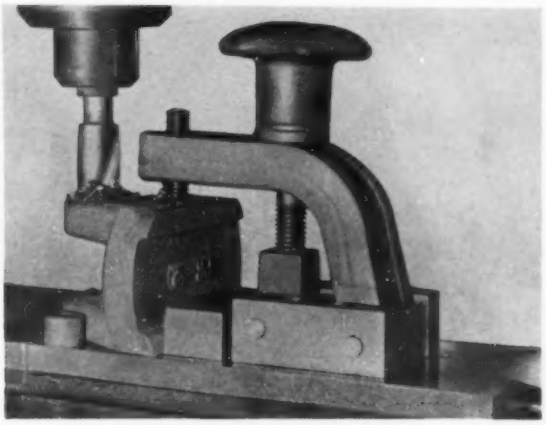
On a retracting clamp for hand operation, a quarter-turn of the screw and a natural arm movement brings the clamp into working position. Another quick movement, and the clamp is retracted. These clamps are made with hand knob, cam or nut, and are simplifying work holding.

To obviate the line-contact distribution of workpiece and table weight between the sine bar roll and gage blocks, Omer E. Robbins Co. has developed a sine plate with a swivel block that fits on the ends of the roll. Regardless of the angle that is required for the machining operation, the block hangs downward so that contact between it and the gage block is over an area. Newest example of use of this principle is a heavy-duty 12-inch square sine plate with sufficient rigidity for angular milling, boring and drilling. Accuracy is of toolroom quality. Two of these sine plates can be bolted together to achieve compound angles. The top plate has both tapped holes and T-slots for clamping work but it is not magnetic.

The trend toward multiple setups has prompted the Northwestern Tool & Engineering Co. to increase their line of clamps. Step clamps for 3/8, 1/2, 5/8, 3/4, 7/8 and 1-inch



**IMP automatic pull down jaws shown in operation.**



**Lodding work-holding retracting clamp is available for operation either by air or by hand in 16 models.**

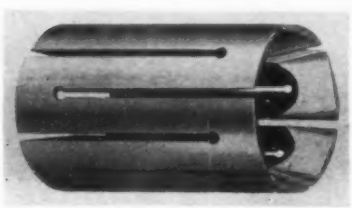
bolts are now available. Three of the most popular sizes, ½, ⅝ and ¾, are furnished with heavy-duty step blocks, 1½ inches wide.

Utilizing the same ball-joint construction which has successfully reduced friction in both rotation and swivelling between pad and body in the Vlier socket head swivel-pad clamp, a knurled head swivel-pad clamp is now available. This addition to the line makes possible faster clamping where a wrench is not required. Ball-joints, using highly polished alloy balls, prevent marring workpiece and conform with surface angularity to 7½ deg in any direction.

James Neill & Co., Ltd. manufacture a wide range of Eclipse magnets and magnetic tools. One is a permanent magnet device with three V-pole faces designed to hold round bars and tubes. Plain pole faces secure flat pieces such as angle iron, channels or girder sections. These powerful Alcomax magnets have a handle which, when turned, controls the amount of magnetic flux.

Another magnetic tool attracting considerable attention is the Eclipse magnetic adjustable link. This tool, by tightening a pair of magnets, may be set at any angle for holding plates and sheets.

A device whereby it is possible to hold stock hydraulically in a die while it is being formed or drawn has been designed by Die-Draulic Grip Inc. No elaborate pumps, motors or circuits are employed. By the use of small liners and pistons in the die, usually occupying less space than pressure springs, a pressure of up to 5000 psi may be obtained. A special control valve maintains pressure at the required level, adjustment being by a thumb screw. This unit applies holding pressure almost from the beginning of the die pad movement, unlike springs which must be under considerable compression before exerting full pressure. At the end of the press stroke, the oil in the cylinders is returned to a storage tank. On the up stroke, oil is again automatically returned to the cylinders by applied air pressure. No oil or air is exhausted into the atmosphere or expended in the process.



**N. A. Woodworth's torque lock for collet chucking.**

## Materials

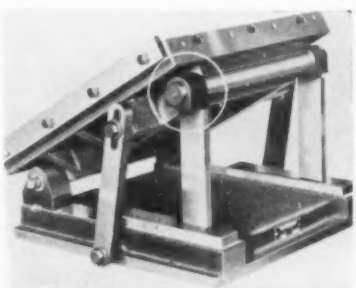
Use of metal powders is expanding because of the ease with which parts can be made to intricate shapes. Vanadium-Alloys Steel Co. is continuing development of stainless steel and high-temperature alloy powders. Hardenable alloy steel powders, such as Vasco 4630-A, are finding increasing application as high-strength structural parts. In contrast to most ferrous base materials produced by powder metallurgy, steel Oilite, developed by the Amplex Div. of Chrysler Corp., has ductility, strength and hardness comparable to low-carbon steel. Depending on grade, ultimate tensile strength is 35-120,000 psi; compressive strength is 25-150,000 psi; shear strength is 100-270,000 psi; and Brinnell hardness ranges from 80 to 300. Fatigue strengths for all grades are 24,000 psi. The hardest grade has a minimum elongation of 1 percent and the softest grade has a maximum elongation of 15 percent. Steel Oilite is being widely used for production of parts of complex shape.

Low melting point alloys, developed by Cerro de Pasco Corp., are easy to handle because they require no measuring of quantities, mixing or bulky equipment. Alloys are used for making short-run dies for sheet metal, nests for dial feeding stations, locators for holding irregularly shaped parts and anchors for punches in dies that will fabricate sheet metal. Hollow objects can be made by forming around low melting point alloys and then melting the alloy out. Such alloys are finding increasing use in anchoring bushings, bearings and stationery parts of machinery. Great savings in machining time result when such parts are located and anchored by the expansion of these alloys.

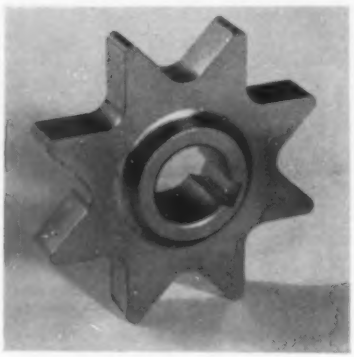
Aluminum compound putty, which air-hardens into permanent metal without flux, chemicals or baking, can be modeled like clay, sprayed like paint or spread like gels. Sculp-Metal, introduced by J. R. Reinertson & Co., hardens into metal that can be drilled, filed, tapped, machined, milled, planed and polished. The finished material is weatherproof, rustproof, and acid and alkali resistant.

Perhaps the most significant advance in recent years in the development of specialty steels has been the addition of lead to improve machining. Use of leaded carbon and alloy steels has increased production of machined parts up to 50 percent with tool life increases of up to 300 percent. Lead has now been added to steel plate to improve its machinability. E-Z Cut steel plate, introduced by Joseph T. Ryerson & Son, Inc., gives promise of similar time and money savings. It is used in production of die bases, jigs, molds and products where considerable machining is required. Ryerson will show how this plate can be flame-cut to approximate shape to further speed machining operations.

Latest addition to Ampco Metal, Inc. line of standard mill and foundry products is a series of Ampco Metal 24 standard die blanks that are available in centrifugally cast rings, solid rounds and rectangles. Rings are available in 27 sizes ranging from 4 to 20 inches outside diameter and 1 to 12½ inches inside diameter. Wall thickness can range from 1½ to 3½ inches. Rounds are available in 11 sizes, rectangles



**Swivel block, circled, on a sine plate for equal distribution of weight.**

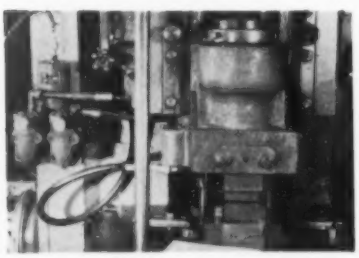


**Powered chain saw sprocket, formerly machined from 52100 steel, is now produced of steel Oilite.**

in 36 sizes. Lengths are 12½ or 6 inches.

As accuracy requirements go up, usable equipment life goes down or new materials must be applied to reduce wear. Stupakoff Ceramic & Mfg. Div. has developed an aluminum oxide material for wear resistance applications. This material can be used on gages, high-temperature antifriction bearings, surface plates, dies, plungers and pistons, nozzles, thread guides and centerless grinding rests to prolong accurate life.

Guaranteed flatness combined with magnesium's light weight and good machinability make possible rapid production of lightweight jigs and fixtures with the Dow Chemical Co.'s tooling plate. Time-consuming milling and grinding are avoided through use of initially flat material. Rolled magnesium plate is available in large sizes and it has dimensional stability because rolling stresses are removed by an oven treatment. Such plate is being used in stretch-forming fixtures, rubber pad form blocks, welding fixtures, routing and fly cutting jigs, and other fixtures. Pioneer Tool Engineering, Inc. will exhibit new uses for its cast aluminum tooling plate and bars. It is easily fabricated and, because of its stability it retains accuracy.



**Die-Draulic Grip holding stock in a die while it is being formed.**

**Brown & Sharpe has developed permanent magnet chucks that are lighter, lower, have increased magnetic surface and have increased holding power.**

Fiber-free drawing surface, high transparency and dimensional stability characterize Stabilene film, developed by Keuffel & Esser. Additional features of flexibility and intial tear strength make this an ideal product for use as patterns or templates and optical comparator charts. The material is also used in printed circuit and wiring design work. Surface coatings for this film include translucent for pen and ink, scribe coat for layout and a variety of light sensitive solutions. Drawings made on this film can be printed directly onto metal that has been sensitized with various reproduction solutions. An original drawing is all that is required from drafting room through tool production.

A disposable industrial paper wiper, developed by Scott Paper Co., is available in two sizes to handle industrial wiping jobs. Disposable wipers insure clean wiping without contamination from previous operations. This also adds to personal safety because a clean wiper does not contain metal chips. Each wiper consists of two embossed sheets joined together. Minute perforations accelerate absorption of liquids and chemical treatment creates wet strength.

## Chemicals, Fluids and Plastics

Reducing heat in cutting operations has always been a common problem for machine designers and plant operating men. Basically, the quality of the fluid has to be controlled to insure the proper reaction in whatever field it is applied. Worn or damaged cutting tools, or incorrect tolerances of machined parts, are the result of not using cutting fluids correctly. With the higher speed more powerful machines of today cutting harder and tougher materials, the chemical producer must keep one step ahead by constant research in all fields where his product might apply.

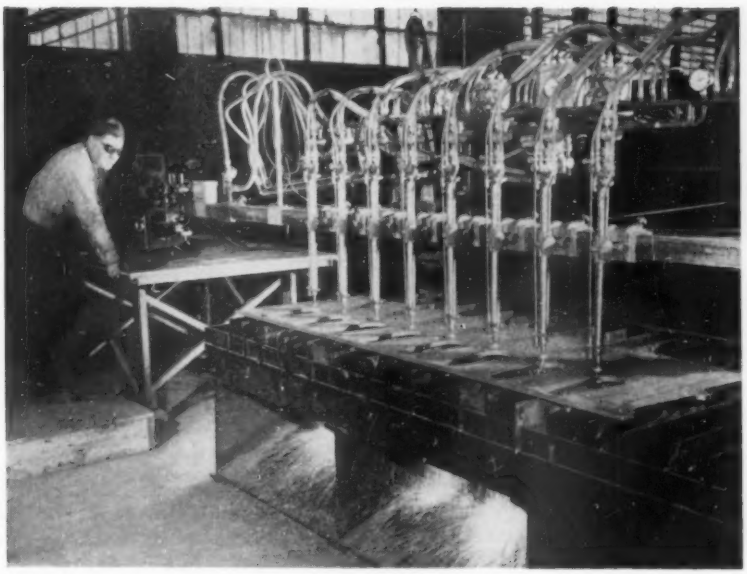
The spray application of cutting oils has been one of the most outstanding developments to be introduced to industry in the past several years. The Norgren Spray-Lube system was one of the first to provide a system for application of cutting oils by the spray method. This introduced compressed air into the cutting tool lubrication procedure. By spraying cutting oils, they can be efficiently directed to the critical areas of the cutting tool. By diffusing the coolant, its ability to absorb heat from the cutting tool can be increased. Because of this, tool life has been considerably increased, and cutting speeds and feeds have been increased.

One of the advantages of Spray-Lube is the cleanliness with which spray can be applied as contrasted to the flood system. Improved working conditions for operators in the absence of hazardous oil-soaked floors around metalworking machines have proved to have considerable value.

The introduction of Spray-Lube makes it unnecessary for machine tool designers to provide large coolant reservoirs, and elaborate pumping and filtering systems usually required in the flood cooling of cutting tools.

A refrigerated mist coolant of the J. R. Reinertson & Co., called Mistic-Mist enables grinding of high-speed steels 25 percent faster. This system can be used in grinding drills and the drills remain cool while the grinding wheel does not load. When this system is used during a drilling operation, drilling speeds can be increased with both drill and work remaining cool. The unit includes a liquid control feature that controls the volume of liquid, or den-

**Aluminum compound putty, Sculp-Metal, air-hardens into metal.**



**E-Z-Cut steel plate can be flame cut to plain or irregular shape.**

sity of lubricity, of the refrigerated mist for controlling specific applications.

A coolant designed to improve the efficiency of modern tools and machines, reduce maintenance cost by preventing rust, sticking or gumming of machine moving parts, and avoid obnoxious odors, has been developed by the Master Chemical Corp. High rates of production and low costs can be achieved with Trim and at the same time tool life is increased. A new Master development is Trim Mist. It is an almost colorless, odorless liquid developed for mist application in cutting and grinding operations. It has high wetting power, making it spread over tools and workpiece quickly, assuring rapid cooling and excellent antiweld action. It also has a high degree of rust inhibition for between-operation protection.

Trim Clear is a special fluid for surface grinding to prevent foaming and rust. It is practically water clear and designed especially for surface grinding where foaming is ordinarily a problem. The main characteristics are that the coolant keeps the wheels clean and protects the machine and parts against rust. It settles cast iron and steel chips extremely rapidly which reduces the tendency for recirculation of swarf between the wheel and the workpiece, producing a more desirable finish. Trim Clear removes heat rapidly, permitting fast grinding and establishment of dimensional size.

Another development of Master Chemical Corp. is called Trim Ti-Grind. It is a clear water-soluble liquid designed especially for grinding titanium and its alloys. It dissolves instantly in hot or cold water, soft or hard. It provides the chemical effect so necessary to prevent the grinding wheel from combining with the titanium in the grinding process.

Triple C, which is water-soluble, harmless to touch and nonflammable, has recently been developed by The Motch & Merryweather Machinery Co. This fluid maintains lubricity under pressure, improves tool performance and lengthens tool life. The cutting coolant helps to prevent galling, welding and rusting. Since it is transparent and does not foam, the operator can watch progress of his work.

Continuing the trend for product versatility, the Graymills Corp. has improved design and construction features of their centrifugal pumping units. Most important is the complete interchangeabiilty of these pumping units with pumps of other makes. They are easy to install and are available in designs to meet JIC standards.

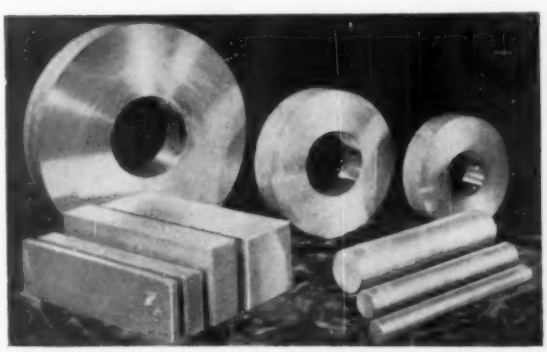
Webber Gage Co. is adding two new Temp-Chek temperature meters designed to give quick, accurate temperature readings of gases, liquids or solids. This completes a line covering the entire temperature range from —50 to +1000 F.

The Mel-O-Flo coolant aerator designed by the Melard Mfg Corp. connects to the coolant tube and mixes atmospheric air with the coolant, resulting in a nonsplash mixture that clings to the workpiece and tools. The aerator may be used individually with a flexible hose, or several lines may be manifolded from one aerator to supply the coolant to several tools (such as used on a transfer machine, or a gang of drills or mills). The improved cooling obtained, results in longer tool life, less down time and increased production. Aerated coolant also makes it possible to use coolant on many drilling jobs which would be impossible with ordinary flood type coolants. The Mel-O-Flo coolant aerator eliminates splash, offering the safety factor of dry floors, as well as effecting savings in production and tool life.

Removing rust, oxide scale, paint and shop soils without changing dimensions of precision parts or causing hydrogen embrittlement, can be accomplished through Oaktite Rustripper developed by Oaktite Products, Inc. Rustripper may be used in hot or cold-water solutions, with or without current and with or without cyanide. It does not attack sound metal and all action stops as soon as the rust has been removed. It provides temporary protection against rerusting. Special equipment is not required with its use and troublesome fumes are not generated. Its disposal requires no more precaution than that of any highly alkaline solution.

The plastics industry made another record last year when approximately 3,600,000,000 pounds of raw materials were produced. This is a 30 percent increase over 1954's production of 2,827,803,000 pounds. The numerous uses of plastic are ever increasing and many of the developments aid the metalworking field.

A new lightweight core material, identified as Epocore, has been developed by Furane Plastics, Inc. It has proved useful in preparing low-cost, light-weight, highly efficient backups for laminated and cast epoxy faces. In practice, the tools are prepared by first making a gel core of epoxy resins, then preparing the laminated backups and then using a core mix to completely fill the inside. This affords a lightweight, high-strength backup for epoxy facing used in metal-forming tools.



**Standard die blanks of Ampco Metal 24.**

**Magnesium tooling plate, developed by Dow, has been used in the construction of this welding jig.**

**Industrial paper wipers can be used in the machine shop without danger of injury from steel shavings.**

Of special significance to the tool engineer is a flexible epoxy, L-940, which has been developed by Rezolin, Inc. This epoxy is suitable for drop hammer dies. The flexibility, as well as the other physical properties, of this product is unusually stable. Rezolin has also developed a brilliant white laminating material known as L-904 with a Gelkote L-914. These products assure ease of handling and high stability, as well as other desirable physical properties. Rezolin Toolplastiks are suitable for the fabrication of drop hammer dies, draw dies, stretch dies, drilling fixtures, welding fixtures and master models.

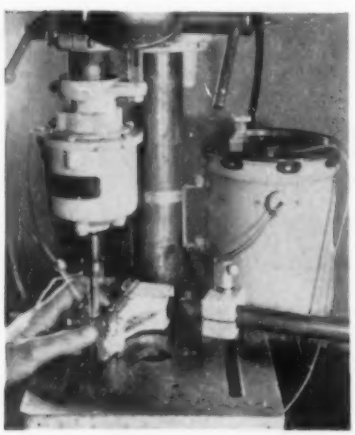
## Optical Tooling

Optical tooling provides a highly exact method of aligning, positioning and measuring, having application in manufacture, erection and maintenance in such different industries as aviation, machine tool and shipbuilding.

For many years, Keuffel & Esser optical instruments have been an essential part of the aircraft industry and are now finding widespread applications in many other fields. In the aviation industry, they are used throughout the entire manufacturing process from building mock-ups to checking the alignment of jigs and fixtures in which component parts are fabricated. The fundamental element of K & E optical tooling is the sighting telescope which is the basis of the alignment telescope, the jig transit and the precision level. Its purpose is to show the position of cross lines on a target with the greatest possible clarity and precision. This purpose is achieved by choosing the combination of optical qualities best suited to a particular application, by skillful design and by perfection in manufacture. These qualities include: resolving power, definition, magnification, eye distance, size of pupil and field of view.

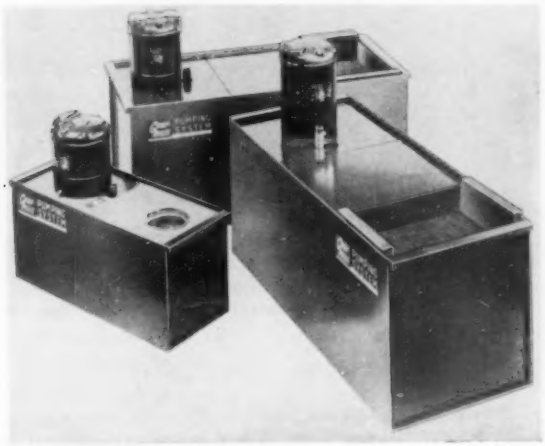
The alignment telescope provides permanent optical reference lines between two points on any large mock-up, jig or structure. The jig transit establishes a reference plane of sight exactly where desired (on line with two marks or precisely at right angles to any other line of sight). The precision or tilting level establishes a reference plane of sight at any desired height. The optical square establishes a reference line or plane of sight precisely at right angles to a pre-established reference line of sight.

Two other important instruments designed by K & E are the optical micrometer and the optical tooling scale. The micrometer is used to move the line of sight or



**Application of Mistic-Mist controls the volume of liquid for density.**

**Epocast plastic core affording a lightweight, high-strength backup for epoxy facing used in metal forming.**



Graymills Superflo coolant pumping units include centrifugal pumps that deliver high volumes for peak requirements but can be throttled down to a trickle.

Norgren Spray-Lube showing multiple application to workpiece.

Many lines of standard equipment and components are being developed to reduce the time required to design and build special gages. Other new equipment is being made because a tool engineer had to satisfy a particular gaging function but could find no commercial product to do the job. Once the immediate application has been satisfied, other uses are seen for the design and it is offered to industry.

**Dial Indicators:** General characteristics of dial indicators now include: fully

reference plane parallel to itself horizontally or vertically to thousandths of an inch. The optical tooling scale provides a highly legible precision target at every tenth of an inch from which measurements to the nearest thousandth of an inch can be made. These instruments enable an engineer to solve almost any type of close-tolerance precision measurement job wih efficiency far superior to plumb bobs, straight edges, precise steel squares, surface plates, indicator gages or shop levels.

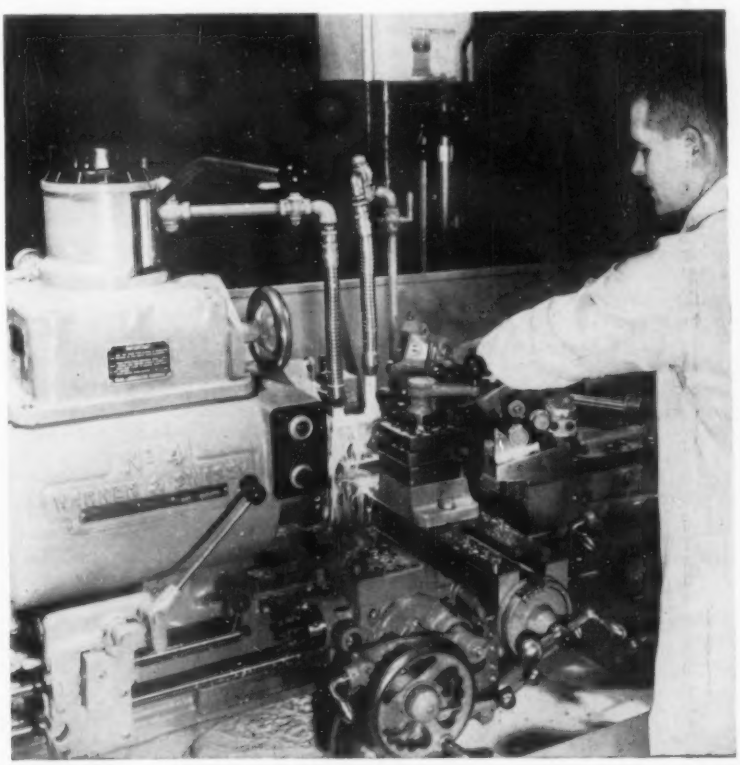
Interferometry, an application of optics new to the engineering field, is now applied to determine surface finish, surface contour and absolute length. The latest Gage Block Initerferometer of the Engis Equipment Co. accommodates 36 gage blocks at one time and provides one of the best proven tools for calibrating these standards of production rapidly to 0.000001 inch.

Laboratory tolerances are now provided on the production floor with development of a portable Alignment Interferometer by Bausch & Lomb Optical Co. Measurements to 0.000003 inch or 0.1 second of arc can be made with extraordinary ease. With this instrument, the production engineer is able to work with tolerances never before attained outside the laboratory.

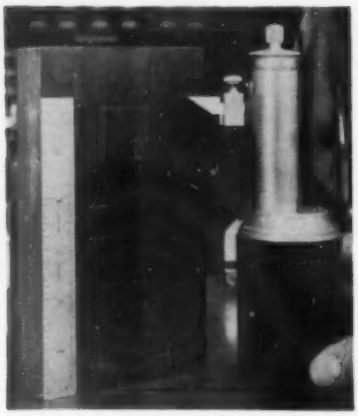
## Inspection Equipment

Inspection equipment is being applied closer and closer to the point of production and its proper application is becoming more important. Some inspection devices are becoming more complex so that there are few possibilities for human or equipment error. Other inspection units are becoming simpler for the same reasons.

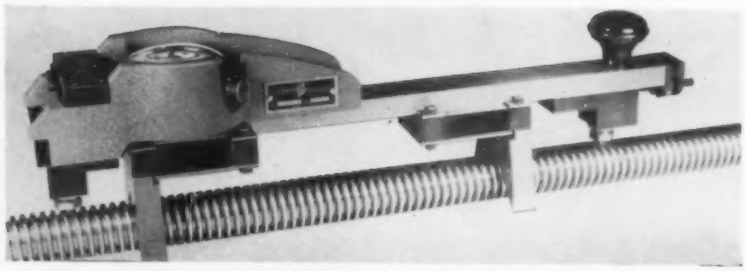
K & E Tilting Level. Note that the level vial is entirely enclosed.



Mel-O-Flo coolant aerator mixing atmospheric air with the coolant resulting in a nonsplash mixture which clings to the workpiece and tool.



**Greist height gage can be used to scribe lines directly on layout.**



**Lead testing comparator developed by Jerpbak-Bayless can be used while the screw is on the machine as a workpiece or as an operating component.**

shockproof mechanism when desired, jeweled bearings when desired, high interchangeability of parts between various models of the same manufacturer to give low spare parts inventories, more rigid bodies, lighter weight, greater accuracy, and balanced or continuous dials. The L. S. Starrett Co. will exhibit representative dial indicators with various of the previously listed characteristics. Petz-Emery Inc. will show dial indicators with fully jeweled fully shockproof mechanisms. The basic design comprises 31 parts, all but six of which are common to 24 models. An Em-re service kit enables repairs, changes in graduation and changes in range. Geneva dial indicators exhibited by The Chicago Dial Indicator Co. feature special internal lever movements that can replace complex gears with increased accuracy.

Adjustable setmasters that will adjust to the same capacity as their companion indicator gage have made it possible to reduce the number of fixed master gages required. The advantages of indicator gages can be applied to almost all inspection jobs. This principle is applied to bore gages, dial snap gages and shallow depth gages by Boice Gages, Inc.

Provided with a mechanical, frictionless amplification device without sliding bearings or gears, the Mikrokator shown by the C. E. Johansson Gage Co. gives accurate measurements for both mass-production checking and individual checking. Two anvils of a master, shown by the Standard Gage Co., Inc., are set by gage blocks to the desired dimension so that master rings are not required for indicating bore gage. Particular feature of this unit is a device that allows the weight of the blocks to come on the fixed anvil while the setting is being made but which takes the weight off the movable plunger of the bore gage while it is being set.

Dial indicator gages can be positioned easily with a universal joint swivel added to The du Mont Corp. magnetic base. The swivel permits a 180-deg vertical and a 360-deg horizontal swing. When in correct position, the unit can be locked. A magnetic base for use with dial indicators, as exhibited by The L. S. Starrett Co., includes a method for reducing the magnetic force so the unit can be positioned easily. It also includes a swivel post.

**Bausch & Lomb alignment Interferometer for use on production floor.**

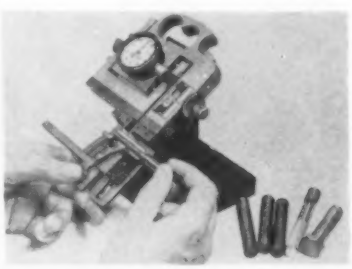
**Height Gages:** By measuring from 0 at the base, the height gage developed by Greist Manufacturing Co. reduces the use of gage blocks. Addition and subtraction is not necessary so that possibilities for computational errors are minimized. It combines the scribing features of a vernier height gage with quick reading figures. As used in layout, it has a scribing head. For inspection work, it can be fitted with a dial indicator.

A height gage that uses gage blocks as a basis for measurement will be shown by the Webber Gage Co. Another height gage has been produced with a lapped base that contacts at the outer edges but is relieved in the center. Shown by C. E. Johansoon Gage Co., this unit avoids vibration as it is moved over a flat surface.

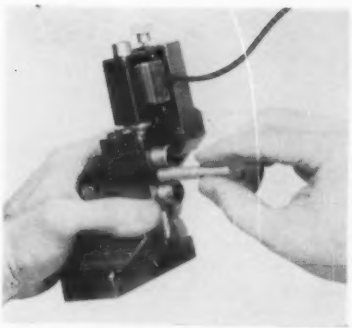
**Gage Blocks:** In addition to developing new types of gage blocks, the DoAll Co. is going to give a calibration report with each set of grade "A" or better blocks. Instead of using blocks with tolerance ranges, which can lead to error build-up, gage block users will know what a given block will measure. In addition, DoAll will release details on how to calibrate gage blocks and how to determine when recalibration is necessary. Examples of building up fixed and indicating gages from square and rectangular gage blocks will also be shown. With accessories, working gages can be made up directly from gage blocks so there is no question of the accuracy of a transferred measurement. Also, when gages are made for special applications, they can be readily altered to meet design changes or other gaging needs.

Laboratory master gage block sets for linear measurements and for angular measurements will be introduced by Webber Gage Co. Linear blocks are accurate to ±0.000001 inch, angular blocks to ¼ second. These blocks are for use in checking working blocks. The linear blocks are made of solid chrome carbide. Webber will also exhibit a thin block set for use where total measurements are under 0.1 inch. This set is designed for daily use.

**Working gages can be made up of square gage blocks and accessories.**



**Thread form and over-all assembly characteristics can be determined with this Standard gage.**



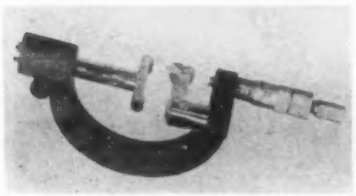
**Simulating 3-wire inspection of threads by use of beads on rolls, this Cleveland instrument can be used to classify threads quickly.**

**Economical small Brown & Sharpe bench centers for work under 18 in. in length.**

**Thread Gages:** With one basic instrument, the Versa-Dial gage, threads can be checked for over-all assembling characteristics. The Standard Gage Co., Inc. has developed special elements that enable this instrument to be used to study thread form. Pitch diameter is measured by a three-wire method in which the operator need not be aware of the wires. By adding jaws with V-edges, this unit can also indicate lead variation. A lead testing comparator has been developed by Jerpbak-Bayless Co. so that inspection of screws can be done on or off a machine. After the gage has been set against a master, it can be used at any point during a production process. Machine tool lead screws can be checked without removing them from the machines.

High-speed inspection of close-tolerance aircraft studs can be accomplished with a unit that simulates the three-wire method by using two rolls. One roll has a single bead and the other has a double bead. Built into a machine, also developed by the Cleveland Instrument Co., the measuring device can automatically classify studs at the rate of 1800 pieces per hour. A bench gage developed by the Bryant Chucking Grinder Co., checks internal and external threads. It has attachments that allow checking for concentricity and squareness of face in relation to a thread. A Bryant internal thread gage uses a segmented head. Thread gage segments are expanded into the workpiece and a dial indicator indicates the actual size of the thread.

A new concentricity attachment has been developed by the Hanson-Whitney Co. for use with H-W external and internal thread comparators. This unit, finished after hardening, makes possible fast, accurate, visual gaging of a thread diameter in relationship with the face, outside diameters, bevels, etc., of the workpiece. This is achieved by rotation or contact of the work against the concentricity attachment, causing dial indicators to show the concentricity or amount of error between the pitch diameter of the thread and related surfaces. Since this is accomplished while the thread diameter is being gaged, separate checking of the work is unnecessary.



**Because it includes a sine bar, the Taper Mike can be used without removing parts from the machine.**

**Standard Gage Details:** To reduce time required to prepare gages for special service, standard components are becoming more available. Huron Machine Products, Inc. has added standard Taperlock blanks in many of the $\frac{1}{32}$ inch sizes. Because standard parts are available over a wider range, it is possible to save much precision production time. The A. G. Davis Gage & Engineering Co. is adding to their line of standard components designed to incorporate repetitive design features of flush-pin and indicator gage details. Newly added units have increased the scope of gaging operations that can be covered by standardized parts.

**Micrometers:** Down time normally required to measure taper, because the part had to be removed from the machine, can be reduced by using a Taper-Mike. Developed by J. R. Reinertson & Co., this unit has been created by mounting a sine bar on a micrometer.

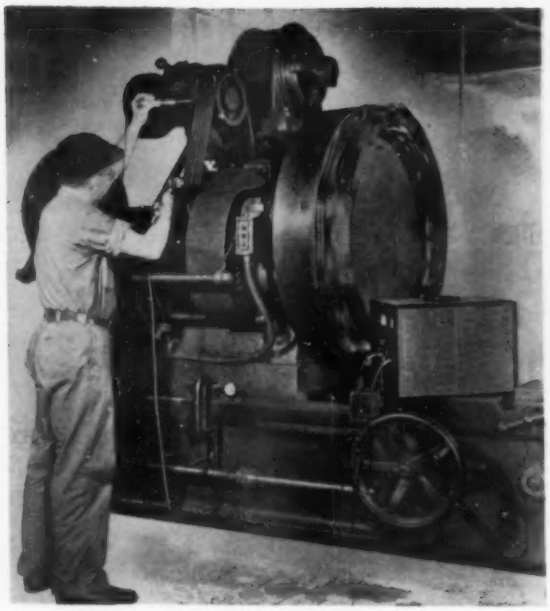
The variable factor of "feel" has been taken out of micrometer measurements with the Hi-Precision micrometer developed by The L. S. Starrett Co. This unit has a double thimble and reads directly in ten-thousandths. Design of the micrometer is such that a positive load is applied after it feels snug. It is then backed off until an even thousandth graduation on the inner thimble lines up with the reading line on the sleeve. The ten-thousandth figure is then read directly from the outer thimble.

**Surface Plates:** Because gage blocks and checking fixtures occasionally seize on surface plates, the Collins Microflat Co. has developed a new lapping method for black granite surface plates. This method results in a continuous bearing surface interspersed with microscopic valleys. These minute reliefs afford sufficient air pocket relief between bearing surfaces to prevent seizure. Profilometer checks indicate these units have finishes of 3 to 16 microinches, RMS.

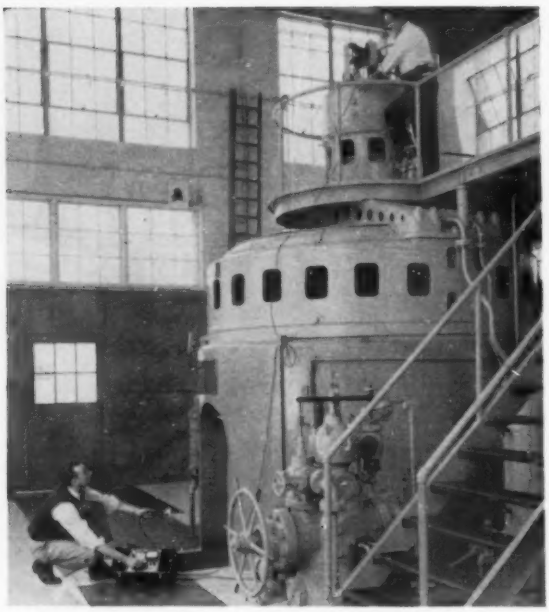
Surface plate calibration has usually been ignored because it has required expensive optical equipment and considerable time. With a system and equipment developed by the Rahn Granite Surface Plate Co., it is possible to completely calibrate a 24 by 36-inch surface plate in 45 minutes. Calibration is done by taking indicator readings under a straight edge that is supported so it can always be in the reference plane. Precision of the calibration is limited only by the precision of the indicator. While this method compares the surface plate to a calibrated straight edge, accuracy of the straight edge is readily proved.

Accurate floor plates have usually been levelled from underneath. Since this requires time, effort and bother, The Challenge Machinery Co. has developed a

**Granite surface plates can be easily calibrated by using Rahn technique.**



**To remove cause of excessive runout in this turning operation, the IR&D vibration analyzer registers speed of the part causing the vibration. Stroboscope pinpoints vibration source.**



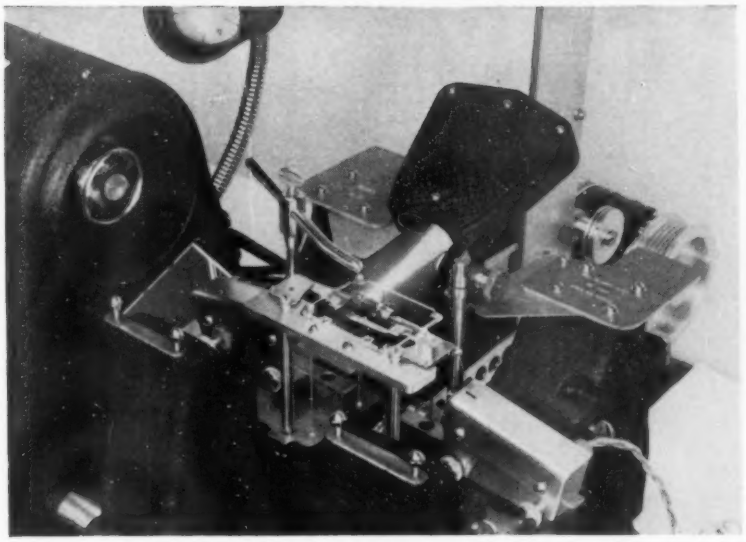
**Vibration analyzer, developed by Tinius Olsen, is used to locate vibrations in rotating machinery. It separates the frequencies found in the rotating parts from the vibrations set up by the parts.**

floor plate that can be adjusted from the top. These plates have a series of adjusting screws mounted in tapped, through holes. When proper adjustment is achieved, a lockscrew is tightened down and a flush, protecting cap screw is inserted at the top. Such plates can be used for extension tables with floor type boring mills, bases for special jigs and for general layout work. Challenge will also exhibit universal box angles that can be used in inspection. Made of semisteel and precision ground, the units can be used as angle plates, universal angle irons or box parallels. Work can be checked in several positions once it has been mounted on one of these angles. Repeated setups are not needed.

**Surface Finish:** Surface finish measuring equipment is being used more because a knowledge of the characteristics of a surface can indicate product performance. Measuring equipment is being used to determine best feeds and speeds for machining, at the machine. Surfaces are being checked as soon as they are produced. Equipment developed by the Micrometrical Mfg. Co. is being applied in automatic production lines to control surface finish. Rejects are separated from good parts and

**A laboratory and inspection instrument for recording surface profiles is called the Proficorder and has been developed by Micrometrical. This machine has a system that will give chart records of surfaces.**

**The Hi-Eff balancing machine developed by Taylor Dynamometer and Machine is air actuated. A button is pressed and the amount and location of out-of-balance can be read directly on a spirit level.**

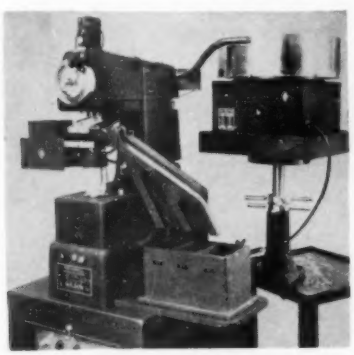


**Binocular light beam scanning arrangement is used when balancing small rotors in the Annis dynograph.**

the number of rejects is a good indication of the control under which the process is operating. The Brush Electronics Surfindicator, and its associated accessories, has moved onto the production floor. A new type pickup permits measurement of cutting edges, bottoms of deep holes and rough surfaces.

In an attempt to reduce the number of types of surface measuring equipment required, Micrometrical Mfg. Co. has developed the Type LJ Tracer that will measure the roughness of more than 85 percent of all the types of surfaces produced by industry. It can be power driven or used manually and will measure such surfaces as those on flats, tapers, splines and gear teeth. Micrometrical has also developed an inspection instrument that will also make a permanent record of the profile.

To the precise determination of surface roughness, lead error or straightness, a new electronic roundness testing machine by Engis Equipment Co. adds graphic records of out-of-roundness to better than 0.000003 inch. It provides a final test for machine setups, manufacturing processes and gaging arrangements for a wide range of precision components, including antifriction ball bearing parts, fuel injection components, hydraulic parts, gear blanks and cams.



**Fully automatic hardness tester, developed by Wilson, can handle ferrous and nonferrous metals.**

Basically a fine microscope, the H. E. Morse Co. Comparoscope contains special optical and illuminating systems that provide for magnified side-by-side viewing of two surface specimens, each illuminated at the same angle. A known standard is compared with an unknown surface and their difference is easily noted. The darker the image, the better the surface. In order to increase the accuracy of checking lapped surfaces, Webber Gage Co. has developed a surface interferometer. Since there is no physical contact with the surface being checked, there is no danger of damage or distortion to the part.

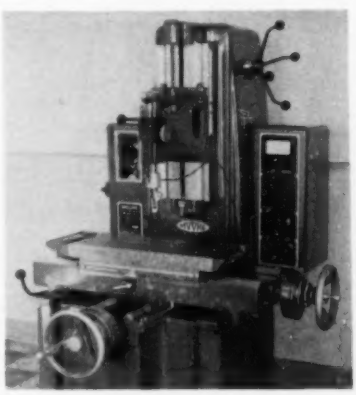
**Balancing Machines:** Because better products result from machining on balanced equipment, and because balanced products operate better, considerable effort has been expended in the development of good balancers. Tests conducted by Merrill Engineering Laboratories have shown that rotating carbide-tipped cutting tools last up to 300 percent longer if they are properly balanced. They will display the Stewart-Warner industrial balancers in which setup is easy and results are quick. Readings are taken as the work coasts through the dynamic and kinetic critical speeds and are not influenced by the drive.

Magnitudes of unbalance are indicated by a meter, calibrated directly in terms of the balancing correction procedure selected, on two new vertical static balancing machines designed by Balance Engineering Co. Unskilled operators can balance parts having no integral shaft. Angular positions are indicated by a stroboscopic lamp and are readable either as locations to remove or add weight.

A new trouble-shooting tool and portable balancer removes guesswork from maintenance, inspection and correction of mechanical troubles in rotating machinery. Developed by the International Research & Development Corp., the Variable Filter can be used to check machinery without dismantling. Direct readings can be made of displacement of one or all vibration frequencies in a complete mechanism. Tinius Olsen Testing Machine Co. has developed a portable balancer that consists of a strobe light, a pickup unit, cable and an electronic amplifier. The unit is capable of differentiating between the comparative amplitudes and various frequencies found in rotating parts and the vibration set up by the parts.

Rotors weighing a small fraction of an ounce can be balanced on a production basis in a new R. B. Annis Co. Dynograph balancing machine. This design was based on the trend toward miniaturization of rotating equipment. On work that is too short for a radial phasing mark to be painted on one end, a binocular light beam scanning arrangement is used. Position of unbalance can be read easily on a cathode ray tube.

**Testing Machines:** Operating on thermo-electric principles, the new Brush Electronics metal indicator can detect variations in chemical composition of grade, metallurgical structure, hot or cold heat-treating processes, plating or coating thickness and general uniformity of material. Destructive tests are unnecessary. Fully automatic hardness testing is possible with a new machine developed by the Wilson Mechanical Instrument Div., American



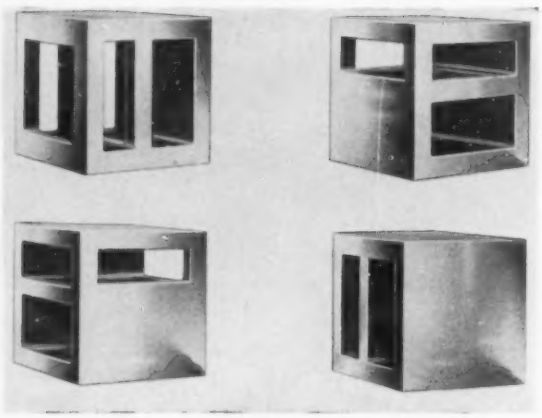
**Precise measurement and inspection of complex contours can be accomplished with the Moore universal machine.**

Chain & Cable Co., Inc. Through the use of tiny photo transistors and intricate timing mechanism, this Rockwell tester is capable of testing the hardness of either ferrous or nonferrous metals at the rate of 1000 pieces per hour. Tested pieces can be sorted to limits as close as two Rockwell points.

Complex, unknown contours can be measured with a new machine deevloped by the Moore Special Tool Co. The cubic concept of geometric accuracy, used in previous Moore equipment, is the basis of this machine. Table positioning is accomplished in both directions by master lead screws. All ways are hardened, ground and lapped. Because they are prismatic in section, the ways do not require gibs or adjustment. Accuracies of the various machine movements are measured in millionths of an inch.

New England Machine and Tool Co. will demonstrate the Model 105 airfoil measuring machine. This machine provides a completely new, direct-reading single-operation method of inspecting airfoil contours on jet engine blades and similar shapes. It measures errors directly from the 10:1 ratio glass or vinyl charts that are used as the basic information all during the production process. The charts are made during the design stages of such irregular or twisted contours and are used to control the generation of the finished shape.

Inspection has been recognized to be an integral part of production, and inspection equipment mirrors the fact that inspection and production should not be remote from each other. Inspection devices supplied to machine operators or built into production lines are as accurate, and in many instances more accurate, than master laboratory checking devices of not many years ago. As in-process inspection embraces the practical aspects of statistical quality control, and as statistical quality control principles are being built into automatic inspection equipment, production accuracy is increasing and scrap is decreasing.

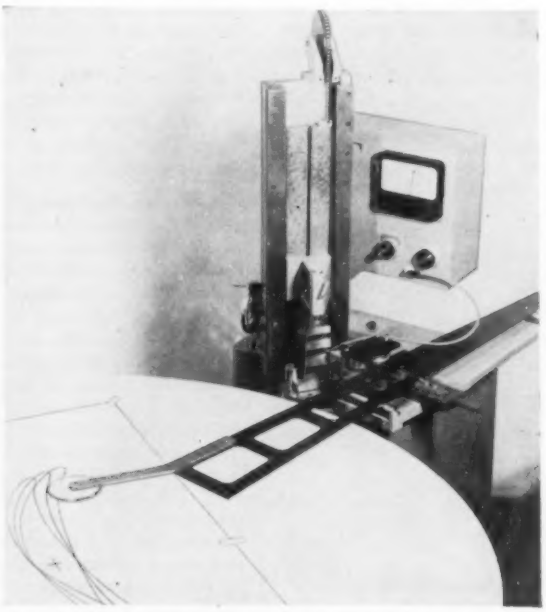


**Semisteel precision-ground box angles developed by Challenge Machinery have proved versatile.**

**Summation:** Tooling for tomorrow must of course be based on the ideas and equipment avaliable today. It would be impossible to put down on paper all of the ideas that will be available at the forthcoming ASTE Industrial Exposition. At this exposition, however, all of the ideas and all of the tools necessary to the planning, production, implementation and inspection will be on display. There will be qualified personnel in attendance to show how the equipment available today can be put to use tomorrow. There will also be an opportunity to make known needs that have not as yet been satisfied. Such an interchange of ideas will do much toward making the tool engineer's task an easier one.

The preceding pages have shown the trends in tooling as evidenced by some of the products and methods that will be exhibited. It is impossible to cover even just the new products that will be shown, let alone the new applications for standard products. Company plans were incomplete at the time of publication and many products that will be shown are so new that pictures, experience data and complete technical details have not been compiled in advance of the show.

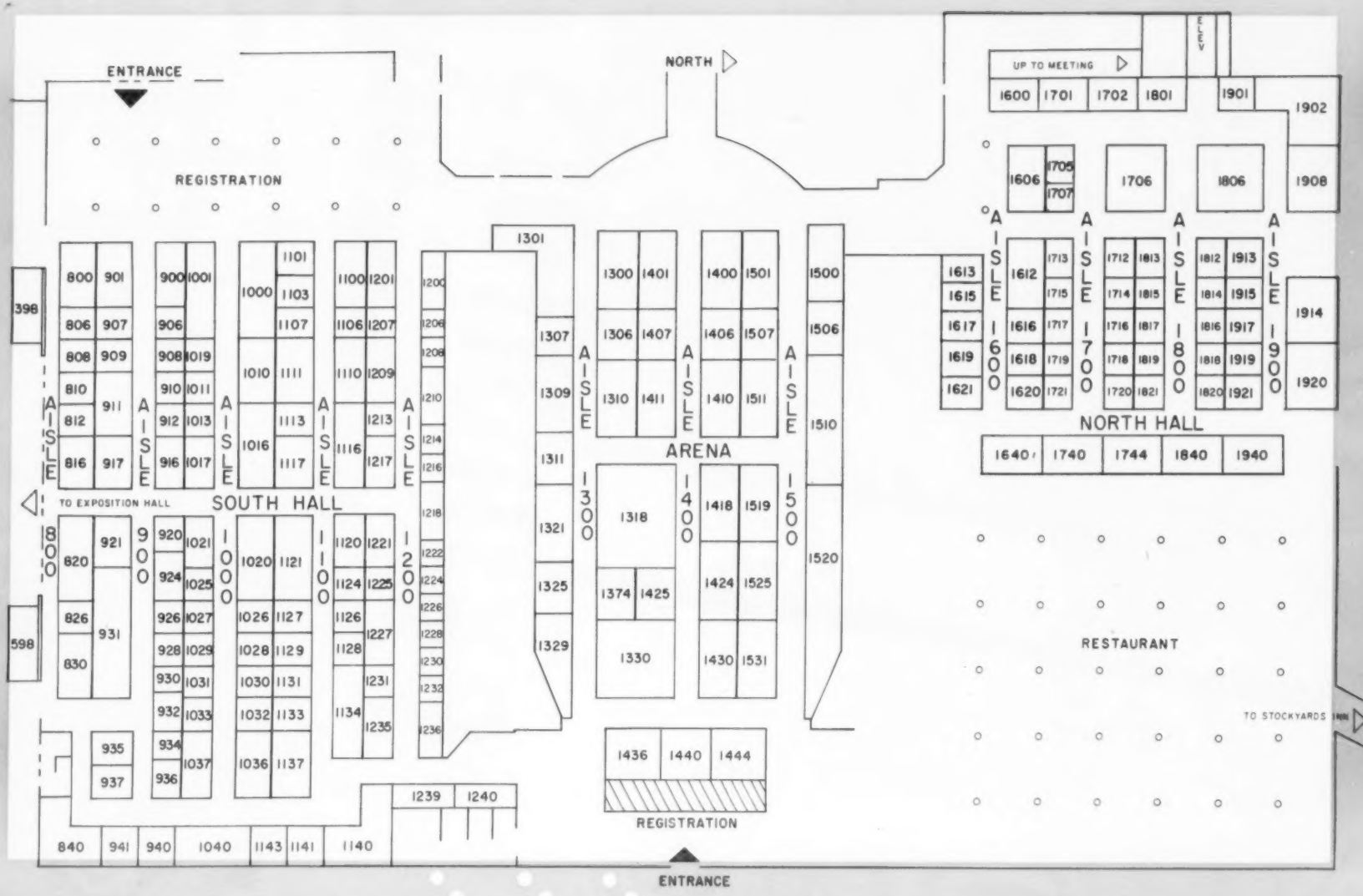
**Brush metal indicator can detect variations in chemical compositions, metallurgical structures and other metal.**



**New England Machine and Tool airfoil measuring machine measures errors directly from the 10:1 ratio glass chart.**

# exhibitors

- Floor plan
- Booth numbers
- Products displayed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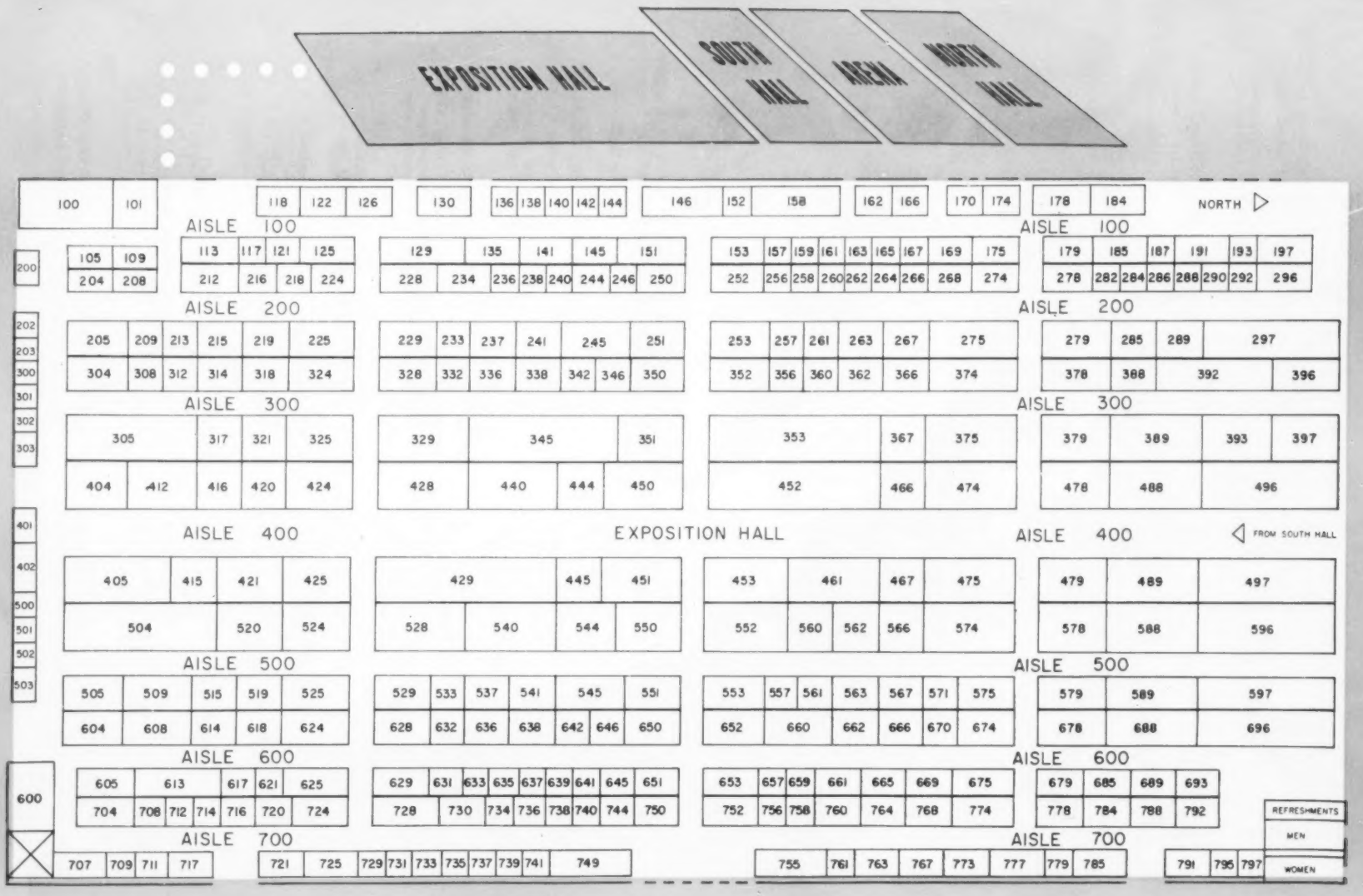


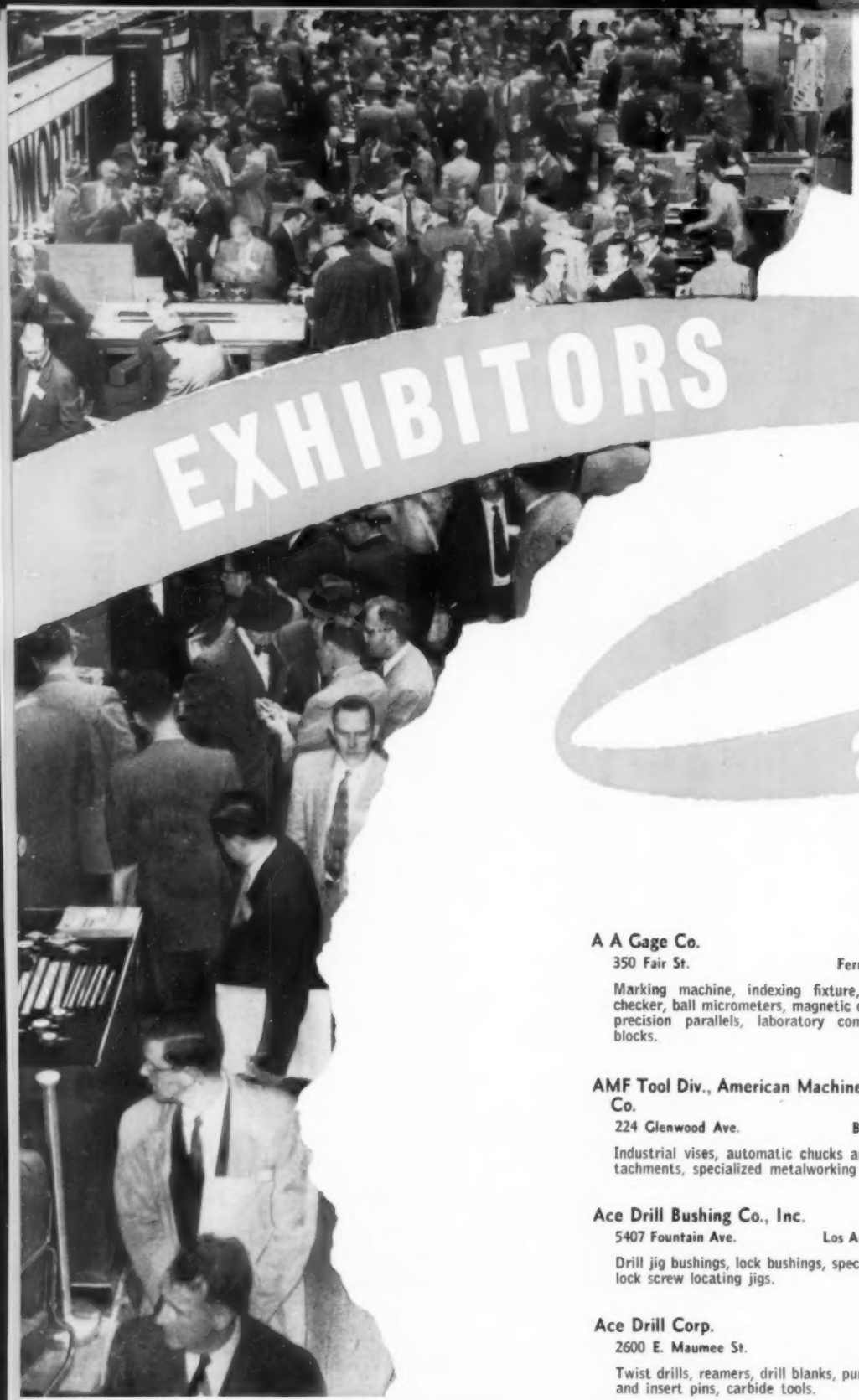

# Floor Plan

## ASTE Industrial Exposition

International Amphitheatre

CHICAGO ILLINOIS

MARCH 19-23



# EXHIBITORS and

Booth No.

**A A Gage Co.** 121
350 Fair St. Ferndale 20, Mich.

Marking machine, indexing fixture, tapered hole checker, ball micrometers, magnetic cylinder square, precision parallels, laboratory comparator, gage blocks.

**AMF Tool Div., American Machine & Foundry Co.** 153
224 Glenwood Ave. Bloomfield, N. J.

Industrial vises, automatic chucks and tapping attachments, specialized metalworking tools.

**Ace Drill Bushing Co., Inc.** 175
5407 Fountain Ave. Los Angeles 29, Calif.

Drill jig bushings, lock bushings, specials and master lock screw locating jigs.

**Ace Drill Corp.** 233
2600 E. Maumee St. Adrian, Mich.

Twist drills, reamers, drill blanks, punches, knockout and insert pins, carbide tools.

Booth No.

**Acme Steel Co.** 178
2840 Archer Ave. Chicago 8, Ill.
Metal stitchers (in operation), carton stitcher, strapping machine (in operation).

**Acme Tool Co.** 402
71 W. Broadway New York 7, N. Y.
Universal lathe toolholders, Meehanite metal inspection tools, portable electric reciprocating tools.

**Adamas Carbide Corp.** 145
Kenilworth, N. J.
Toolholder for carbide inserts.

**Adcock & Shipley, Ltd.** 415
30 Church St. New York 7, N. Y.
Radial drill, automatic cycle milling machine, geared head milling machine.

Booth No.

**American Aerator Co.** 1817
P. O. Box 612 Clifton, N. J.
Coolant Aerators.

**American Cam Co., Inc.** 529
95 Gramby St. Bloomfield, Conn.
Tap and drill adapters; screw machine and special cams; cutoff blades; drill holders, tap holders, toolholders, recessing toolholder; standard circular form tools, special tools; automatic screw machine.

**American Coldset Corp.** 205
87-89 Court St. Paterson 3, N. J.
Diamond tools, diamond wheels, diamond core bits.

**American Cystoscope Makers, Inc.** 285
1241 Lafayette Ave. New York 59, N. Y.
Borescopes, optical flats, sighting telescopes.

# PRODUCTS DISPLAYED

**Alameda Gage Co.** 1720
10851 Capital Ave. Oak Park 37, Mich.
Thread gages.

**Alemite Div., Stewart-Warner Corp.** 1216
1826 Diversey Pky. Chicago 14, Ill.
Lubrication equipment, centralized lubrication systems, oil-mist systems.

**Allegheny Ludlum Steel Corp.** 588
2020 Oliver Bldg. Pittsburgh 22, Pa.
Tool steels, carbides, forging and casting products.

**Allen Tool Co.** 729
240 N. Fountain Ave. Springfield, Ohio
Jigs and fixtures.

**Allied Witan Co., Inc.** 908
P. O. Box 2770 Cleveland 11, Ohio
Air exhaust mufflers for air operated equipment.

**Almco Div., Queen Stove Works, Inc.** 704
505 Front St. Albert Lea, Minn.
Barrel finishing equipment, materials and accessories, submerged finishing barrels, fixture machines and fixtures.

**Alpha Molykote Corp., The** 303
65 Harvard Ave. Stamford, Conn.
Special lubricants.

**American Drill Bushing Co.** 428
5107 Pacific Blvd. Los Angeles 58, Calif.
Drill jig bushings and bushings for use in plastic drill jigs.

**American Herforder Corp., The** 619
1801 W. Columbia Ave. Chicago 26, Ill.
Centerless grinders, tool & cutter grinders, automatic hydraulic shaper, hydraulic OD-ID cylindrical grinders.

**American Metal Market** 260
18 Cliff St. New York 38, N. Y.
Publications: *American Metal Market, Metal Statistics,* reference book.

**American Positive Grip Vise Corp.** 1715
Olivine St. Willimansett, Mass.
Holding fixtures.

**American Pullmax Co., Inc.** 689
2455 N. Sheffield Ave. Chicago 14, Ill.
Universal shearing and forming machines, trimmers.

**American SIP Corp.** 405
100 E. 42nd St. New York 17, N. Y.
Jig borers, measuring equipment.

**Ames, B. C., Co.** 934
131 Lexington St. Waltham 54, Mass.
Micrometer dial indicators and gages.

Booth No.

**Ampco Metal, Inc.** 204
1745 S. 38th St. Milwaukee 46, Wis.

Cast die materials, stock dies, sand and centrifugal castings, extrusions and shapes, metal parts, forgings, coated welding rods; electrodes and accessories; mill and foundry stock products: centrifugally cast standard bars, sheet and plate for wear plates and cast guidepost bushings.

**Amplex Div., Chrysler Corp.** 253
6501 Harper Ave. Detroit 31, Mich.

Powder metal products: self-lubricating bearings and bearing stock, finished machine parts, permanent metal filters and friction units.

**Anderson, F. E., Oil Co., Inc.** 467
Box 111 Portland, Conn.

Metal working coolants, grinding fluids, machine cleaners.

**Annis, R. B., Co.** 1214
1101 N. Delaware St. Indianapolis 2, Ind.

Balancing machines, electric etchers, demagnetizing equipment, split core current transformers.

**Apex Tool & Cutter Co., Inc., The** 174
Shelton, Conn.

Single and multiple toolholders, drop forged tools, carbide-tipped tools, carbide plug for roughing with finishing tools, single and multiple purpose milling cutters, cutters, radius grinding fixture.

**Applied Hydraulic Magazine, The Industrial Publishing Group** 641
1240 Ontario St. Cleveland 13, Ohio

Publications: Applied Hydraulic Magazine, catalogs.

**Armour Research Foundation—ASTE** 504
Technology Center Chicago 16, Ill.

Display of industrial diamonds, diamond tool work shop, model of diamond mine.

**Armour Research Foundation of Illinois Institute of Technology** 1618
Technology Center Chicago 16, Ill.

Nuclear reactor model.

**Armstrong Bros. Tool Co.** 1324
5200 Armstrong Ave. Chicago 30, Ill.

Carbide insert toolholders, carbide cutters, toolholders, cutters, lathe dogs, clamps, setting-up tools, wrenches, machine shop specialties, pipe tools.

**Aro Equipment Corp., The** 638
Bryan, Ohio

Air-operated drilling units, multiple spindle assembly tools, portable pneumatic tools, air hoists, air line accessories, quick-disconnect couplers.

**Arrow Tool & Reamer Co.** 645
418 Livernois Detroit 9, Mich.

Carbide-tipped and high-speed steel cutting tools, drills and reamers, counterbores, countersinks, end mills, aircraft router bits.

Booth No.

**Arwood Precision Casting Corp.** 661
70 Washington St. Brooklyn 1, N. Y.

Investment castings.

**Ateliers Marcel Pegard, S. A.** 317
35 Ave. Reine Elisabeth Andenne, Belgium

Boring machine, jig boring, boring and milling machine.

**Atlas Press Co., Clausing Div.** 1418
1915 N. Pitcher Kalamazoo, Mich.

Lathes, vertical milling machines, single and multiple spindle drill presses, lathe production attachments.

**Atlas Tack Corp.** 1813
Fairhaven, Mass.

Eyelet attaching machines, eyelets.

**Austenal Laboratories, Inc.** 916
224 E. 39th St. New York 16, N. Y.

Precision investment castings of high temperature alloys, stainless steels, low alloys, plain carbon steels and some of tool steels.

**Austin Industrial Corp.** 550
76 Mamaroneck Ave. White Plains, N. Y.

Vertical miller, universal miller, plain millers, miller accessories, universal shaper, standard shapers.

**Automotive Industries** 1531
Chestnut & 56th Sts. Philadelphia 39, Pa.

Publications.

**BMT Mfg. Corp.** 709
110-112 E. 9th St. Elmira Heights, N. Y.

Honing barrel finishing machine, barrel finishing compounds, abrasives and various preformed zinc, ceramic. Natural stone media, samples of processed parts.

**Bachmann, Eric. R., Co., Inc.** 1301
27-11 41st Ave. Long Island City 1, N. Y.

Optical profile grinder, heavy duty shaper, tool and cutter grinder, hob sharpener, hand turret lathe, gear hobber, automatic cutoff saw, ground hobs, threading tools, chasers, ring and plug thread gages, centerless grinder, micro taps, micro thread gages, knurls, knurling tools.

**Bakelite Co.** 397
300 Madison Ave. New York 17, N. Y.

Tools, dies, jigs, and fixtures of Bakelite epoxy compounds.

**Balance Engineering Co.** 1111
5030 W. Lake St. Chicago 44, Ill.

Dynamic and static balancing machines.

**Banner Welder, Inc.** 763
6820 N. 43rd St. Milwaukee 9, Wis.

Cylinder forming seam welder, projection welder.

Booth No.

**Barer Engineering & Machinery Co., Ltd.** 1424
1252 Notre Dame St., W. Montreal, Can.
Toolroom and production lathes, shapers, drill presses, universal grinding machine.

**Barker Engineering Co.** 731
500 Green Rd. Cleveland 21, Ohio
Horizontal milling machine, horizontal bench milling machine, dual-head milling machine.

**Barnes Drill Co.** 1127
814 Chestnut St. Rockford, Ill.
Magnetic & fabric filter, magnetic coolant separator, honing abrasives, honing tools.

**Barry Controls Inc.** 167
700 Pleasant St. Watertown 72, Mass.
Demonstration of vibration isolators on punch press.

**Baumbach, E. A., Mfg. Co.** 1027
1812 S. Kilbourn Ave. Chicago 23, Ill.
Die sets and accessories, pendant type control station.

**Bausch & Lomb Optical Co.** 1032
635 St. Paul St. Rochester 2, N. Y.
Bench comparator, microscopes, wide field tube microscope (erect image), surface comparator, measuring magnifiers, interferometer.

**Beaver Tool & Engineering Corp.** 444
2850 Rochester Rd., Box 429 Royal Oak, Mich.
Quick change holders, boring bars, heads, arbors, arbor spacing collars, bearings and nuts, centering plugs and keeper key.

**Beckett-Harcum Co.** 545
1087 Wayne Road Wilmington, Ohio
Air and hydraulic valves; automatic drill press feeds (side arm); drilling and tapping machines, single and multiple; air operated rotary index units, hydraulically controlled; clamping cylinders.

**Bendix-Westinghouse Automotive Air Brake Co.** 537
901 Cleveland St. Elyria, Ohio
Industrial air controls including: air chambers; roto-chambers; two, three and four-way valves; tubing fittings; hose and fittings; reservoirs; miscellaneous air valves.

**Besley-Welles Corp.** 637
178 Dearborn Ave. Beloit, Wis.
Standard and special carbide tipped tools, gages.

**Black & Webster, Inc.** 258
445 Watertown St. Newton 58, Mass.
Electric impact hammer, electric staking machine, electric indexing table, automatic cutoff machine.

**Blake, Edward Co., Inc.** 261
437 Cherry St. West Newton 65, Mass.
Chamfer grinders, flute and drill grinders, diamond drill grinders, surfacing finish standards.

Booth No.

**Bliss, E. W., Co.** 505
1375 Raff Rd., S. W. Canton 10, Ohio
Die sets, die springs, die supplies.

**Boice Gages, Inc.** 932
Staatsburg, N. Y.
Dial bore and snap gages and adjustable masters, shallow depth gages and adjustable masters, depth gages and adjustable masters, length gages, angle gages, design manual for gage engineers.

**Bokum Tool Co.** 136
14775 Wildemere Ave. Detroit 38, Mich.
HSS and carbide boring tools, thread recessing tools and back chamfering tools, resharpening fixtures, HSS and carbide O-ring grooving tools and retaining ring grooving tools, external turning and threading tools.

**Boyar-Schultz Corp.** 1510
2000 S. 25th Ave. Broadview, Ill.
Screw machine tools; profile grinders (bench type, single and dual spindle); surface grinders, hand feed and hydraulic; copper head laps and sleeves, T-slot bolts, nuts and washers, lead screw tapping attachment and hydraulic bar feed.

**Bridgeport Machines, Inc.** 1507
500 Lindley St. Bridgeport 6, Conn.
Milling machines, milling attachments, accessories.

**Briney Mfg. Co.** 159
1165 Seba Rd. Pontiac, Mich.
Precision adjusting boring quills.

**Bristol Co., The** 541
Waterbury 20, Conn.
Multiple-spline and hex socket set screws; socket shoulder cap, button head, flat head screws; through-broached socket set screws for automatic hopper feeding; dowel pins, pipe plugs.

**Brooke, Walter H., Machine Tools** 432
5740 W. Chicago Ave. Chicago 51, Ill.
Jig and fixture components, indexing head and high-speed hand grinders, circular form tool sharpening fixture (in operation), screw machine accessory specialties.

**Brown & Sharpe Mfg. Co.** 374
235 Promenade St. Providence 1, R. I.
Precision tools and gages, electronic measuring equipment, Johansson gage blocks and accessories, milling cutters, arbors, adapters and collets, screw machine tools, permanent magnet chucks, vises, pumps, ground flat stock, miscellaneous equipment.

**Bruning, Charles, Co., Inc.** 1001
4700 W. Montrose Ave. Chicago 41, Ill.
Optical tooling instruments, drafting table, drafting machines, circular drawing machines, reproduction machines, electric erasing machines.

**Brush Electronics Co.** 1017
3405 Perkins Ave. Cleveland 14, Ohio
Electronic instruments for surface finish control and nondestructive comparison of physical properties.

# Which will it be—?

# Price

# Cost

As you well know, *price* of new equipment is only the beginning. Actual production savings determine real equipment *cost*.

From this realistic *cost* standpoint you can't beat Erickson collet chucks. Here's why:

Guaranteed accuracy of .0005" and superior gripping power of Erickson collet chucks assure proper drill alignment. Drills then cut evenly on both cutting lips permitting faster machine feeds and proper speeds . . . give more holes per grind.

What's more, ease of operation greatly reduces set-up time and since Erickson chucks can grip on the flutes, you can stub your drills . . . extend tool life . . . maintain accuracy.

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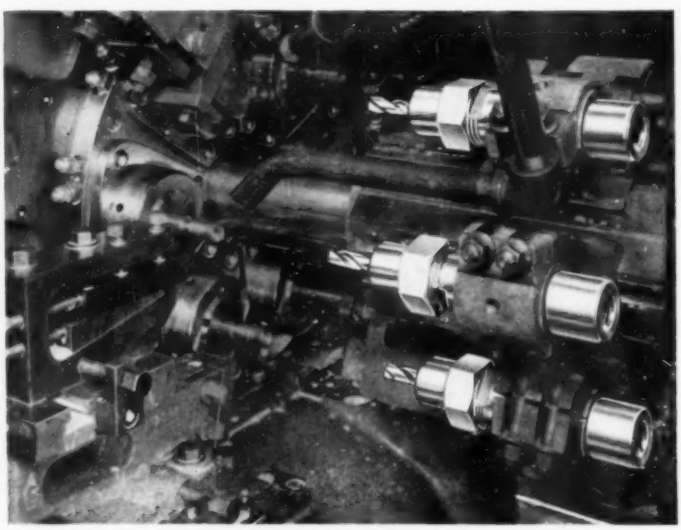

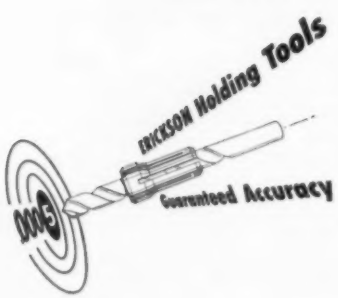


COLLET CHUCKS • FLOATING HOLDERS
TAP CHUCKS • TAP HOLDERS • AIR-OPERATED
CHUCKS • EXPANDING MANDRELS • SPECIAL HOLDING FIXTURES

Booth No.

**Bryant Gage & Spindle Div., Bryant Chucking Grinder Co.** 901
257 Clinton St., P. O. Box 620 Springfield, Vt.

Boring spindles, thread gages—Internal and External, bore gages, concentricity gages, inspection equipment, electric motors, spindles, surfacing plates, magnetic memory drums, face squareness gages.

**Buck Mfg. Co.** 1801
100 Roberts Rd. Los Gatos, Calif.

Magnetic drill press, magnetic plate clamp, magnetic drill vise.

**Buck Tool Co.** 650
2015 Schippers Lane Kalamazoo, Mich.

Power chucks, scroll chucks, independent chucks, compensating chuck.

**Buckeye Tools Corp.** 113
P. O. Box 966 Dayton 1, Ohio

Portable air and electric powered tools, including drilling, abrasive and fastening tools and special tools.

**Burg Tool Mfg. Co., Inc.** 389
P. O. Box 311 Gardena, Calif.

Turret type drilling and tapping machines, neoprene mounted, full floating toolholders, tappers, accessories.

**Cadillac Stamp Co.** 212
17315 Ryan Rd. Detroit 12, Mich.

Hydraulic marking machines, hand tag marker, impact press, special marking dies, hand and machine holders, automatic numbering heads, micrometer screw stop.

**Cammann Mfg. Inc.** 140
2700 Henninger Rd. Cleveland 9, Ohio

Electric tap remover and electrical spark discharge machine.

**Capewell Mfg. Co., The** 1141
60 Governor St. Hartford 2, Conn.

Hand and power hack saw blades, band saws, pipe fitters hand tools, hammers, ground flat tool steel.

**Carboloy Dept., General Electric Co.** 1318
11177 E. Eight Mile Rd. Detroit, Mich.

Cemented carbide cutting tools, wire drawing dies, blanking, drawing, forming and piercing dies; cemented carbide blanks; toolholders, wear proofing applications; cemented oxide tools, vacuum melted metals, thermistors and thyrite varistors.

**Carpenter Steel Co., The** 1310
Reading, Pa.

Tool and die steels, high-speed steels, plastic mold steels, drill rods, stainless steels, special purpose alloy steels and magnatic core irons.

**Carter Controls, Inc.** 636
2800 Bernice Rd. Lansing, Ill.

Air and hydraulic cylinders, air valves, rotary actuators, remote controls, air and hydraulic clamps, power pack cylinder and valve units.

Booth No.

**Case-Maul Mfg. Co., Inc.** 635
22 Harker St. Mansfield, Ohio

Toggle action clamps.

**Cash, A. W., Co.** 308
540 N. 18th St. Decatur, Ill.

Turret lathe drive, cross slide attachment, remote positioner, multiple hydraulic control, pressure reducing and regulating valves, temperature safety valve, temperature regulator, hydraulic oil pumping unit, hydraulic relief valve, positioning control, power cylinder, hand control valve.

**Cawi Machine Co., Inc.** 1901
34 Exchange Pl. Jersey City 2, N. J.

Twist drill grinding machines, web thinning machine, saw sharpening machine, cutter tester, tool and cutter grinder.

**Century Electric Co.** 252
1806 Pine St. St. Louis 3, Mo.

Flange mounted motor, fractional horsepower motors, integral horsepower motors, selective speed unit (driving 4 motors).

**Cerro de Pasco Corp.** 773
300 Park Ave. New York 22, N. Y.

Cerro alloys, metal spraying equipment (in operation), casting and soldering.

**Challenge Machinery Co., The** 941
19 N. First St. Grand Haven, Mich.

Welding table, adjustable floor plate, hand scraped surface plate, precision ground surface plate, black granite surface plate, clamp edge layout table, straightedge, angle plates, angle irons, box parallels, cube box parallels, vee-blocks.

**Chemical Development Corp.** 286
Endicott St. Danvers, Mass.

Plastic tooling steel, aluminum repair putty, heat resistant material for plastic and rubber molds, adhesive for reclaiming work grinding segments.

**Chicago Dial Indicator Co.** 1030
180 N. Wacker Dr. Chicago 6, Ill.

Bench centers; concentricity, dial, snap and depth gages; dial indicators; magnetic bases and dial indicator test sets.

**Chicago Pneumatic Tool Co.** 1321
6 E. 44th St. New York 17, N. Y.

Air powered and electric screwdrivers and nutrunners.

**Chicago Rivet & Machine Co.** 250
9600 W. Jackson Blvd. Bellwood, Ill.

Tubular and split rivets, automatic rivet setting machines.

**Chicago Tool & Engineering Co.** 262
8383 S. Chicago Ave. Chicago 17, Ill.

Production vises, milling attachments for lathes, rotary and indexing tables, angle plates, bench mills.

Booth No.

**Chicago Tramrail Corp.** 445
1330 S. Kostner Ave. Chicago 23, Ill.

Working model of automatic storage system.

**Ciba Co., Inc., Plastic Sales Div.** 1330
627 Greenwich St. New York 14, N. Y.

Epoxy resins.

**Cincinnati Milling Machine Co., The, Process Machinery Div.** 100
4701 Marburg Ave. Cincinnati 9, Ohio

Induction hardening machine and surface hardening machine (in operation).

**Cincinnati Sub Zero Products** 665
3932 Reading Rd. Cincinnati 29, Ohio

Industrial freezers.

**Cleco Div., Reed Roller Bit Co.** 688
P. O. Box 2119 Houston 1, Tex.

Pneumatic tools and accessories including screwdrivers and nut runners, impact wrenches, grinders, sanders, wire brush machines, chipping hammers, riveters, rammers, sump pumps, coupling ends, clamps, air valves, blowguns, air line lubricators, filters, etc.

**Cleveland Cutter & Reamer Co.** 758
7400 Madison Ave. Cleveland 2, Ohio

Special metal cutting tools.

**Cleveland Grinding Machine Co.** 1129
1643 Eddy Rd. Cleveland 12, Ohio

Visual grind optical contour and profile grinding machine.

**Cleveland Instrument Co., Inc.** 920
735 Carnegie Ave. Cleveland 15, Ohio

Electronic indicator, electronic production gage, electronic microcomparators, attachment for jig borers and jig grinders.

**Coffey-Cummins Mfg. Co.** 733
16 N. Marengo Ave. Pasadena 1, Calif.

Drilling and boring tools.

**Cogsdill Tool Products, Inc.** 185
12980 W. Eight Mile Rd. Oak Park 37, Mich.

Deburring and chamfering tools, bearingizing tools for finishing internal and external bearing surfaces, thrust faces and contours.

**Collins Microflat Co.** 912
2326 E. 8th St. Los Angeles 21, Calif.

Black granite surface plates, toolmakers' flats, angle plates, parallels, straight edges, angle iron stands for surface plates.

**Columbia International Corp.** 707
10-35 44th Dr. Long Island City 1, N. Y.

Optical jig boring machine, coordinate jig boring machine, cylindrical grinder, hydraulic surface grinder.

Booth No.

**Commander Mfg. Co.** 800
4225 W. Kinzie St. Chicago 24, Ill.

Multiple drill, coolant table, drill chip breaker, multi-angle drill unit, spindles, tappers.

**Conover-Mast Publications, Inc.** 304
205 E. 42nd St. New York 17, N. Y.

Publications: Mill and Factory, Purchasing, Purchasing Directory.

**Cooper Weymouth, Inc.** 208
277 Noble Ave. Bridgeport 8, Conn.

Air and mechanical slide feeds, stock straighteners.

**Count O Larm Co.** 744
1271 W. North Ave. Chicago 22, Ill.

Electric counter and alarm system for automatic screw machines.

**Crafts, Arthur A., Co., Inc.** 1025
603 Newbury St. Boston 15, Mass.

Carbide cutting, tools, gages and wear parts; diamond tools, dressers and gaging points.

**Crane Packing Co.** 1227
6400 Oakton St. Morton Grove, Ill.

Lapping machines, polishing stands and plates, monochromatic lights and optical flats, hand lapping plates, mechanical packings and seals, teflon products, joint sealing compound, high temperature thread compound.

**Crescent Tool & Machine Co., Inc.** 144
1780 Southfield Rd. Lincoln Park, Mich.

Hydraulic quill type power unit.

**Crodian and Co.** 1222
4897 Kessler Blvd., East Dr. Indianapolis 20, Ind.

Precision air chucks and equipment, rotating air unions, air equipment.

**Crucible Steel Co. of America** 297
Henry W. Oliver Bldg., Mellon Sq. Pittsburgh 22, Pa.

Tool and die steels, high-speed steels, hollow tool steels, tool bits, drill rod.

**Crystal Lake Grinders** 693
Crystal Lake, Ill.

Surface grinder with special attachment, universal roll grinder.

**Cushman Chuck Co., The** 579
806 Windsor St. Hartford 2, Conn.

Power and hand-operated lathe chucks, accessory equipment, rotating air cylinders, power wrenches, special purpose chucks and equipment.

**Dake Corp.** 1707
633 Monroe St. Grand Haven, Mich.

Arbor presses, hand-operated hydraulic presses, air-operated hydraulic presses, electrohydraulic presses.

Booth No.

**Danly Machine Specialties, Inc.** 596
2100 S. Laramie Ave. Chicago 50, Ill.

Die sets and die makers' supplies.

**Davey Compressor Co.** 1820
600 Franklin Ave. Kent, Ohio

Rotary air compressors.

**Davis, A. G., Gage & Engineering Co.** 1134
21435 Dequindre Hazel Park, Mich.

Components for processing and designing gages, indicator gage components and gage-pin assemblies, flush-pin gage components, indicator and flush-pin depth gages, indicator internal groove diameter gages.

**Davis Boring Tool Div., Giddings & Lewis Machine Tool Co.** 489
142 Doty St. Fond du Lac, Wis.

Line boring bars, block type cutters, toolholders, boring heads, stub boring bars, planer tools, arbors and sleeves.

**Dazor Manufacturing Corp.** 784
4483 Duncan Ave. St. Louis 10, Mo.

Drafting room equipment; inspection equipment; lighting fixtures both stationary and portable, fluorescent and incandescent; magnifiers; optical apparatus; quality control instruments; toolroom accessories.

**Delpark Corp. & Industrial Filtration Co.** 567
P. O. Box 271 Lebanon, Ind.

Industrial filters.

**Detroit Milling Cutter Co., Futurmill Div.** 329
28625 Grand River Ave. Farmington, Mich.

Solid carbide indexable milling cutters, milling spindles, milling machines, planer conversion.

**Detroit Power Screwdriver Co.** 571
2801 W. Fort St. Detroit 16, Mich.

Magazine fed power screwdriving machines, selective feeding device.

**Detroit Reamer & Tool Co.** 224
780 W. Maple Rd., Box 174 Birmingham, Mich.

Special cutting tools: high-speed steel and carbide tipped; centers, toolholders and circularity grinding attachment.

**Detroit Stamping Co.** 752
350 Midland Ave. Detroit 3, Mich.

Toggle and portable clamps, arbor spacers and shims, steel and brass shim stock, feeler gage stock, standard blower housings, stampings.

**DeVlieg Microbore Co.** 421
2720 W. Fourteen Mile Rd. Royal Oak, Mich.

Quick change precision tooling for turning, boring and facing operations.

**Die-Draulic Grip, Inc.** 632
528 Butterworth, S.W. Grand Rapids 4, Mich.

Hydraulic die grip equipment (one model in operation); portable die cushion; samples of stampings.

Booth No.

**Dietzgen, Eugene, Co.** 785
2425 N. Sheffield Ave. Chicago 14, Ill.

System of producing metal templates. Template making products; drawing, scribing and sensitized media; metal template sensitizing machine, and presensitized template metal.

**DoAll Co., The** 1520
254 N. Laurel Ave. Des Plaines, Ill.

Band sawing machines; cutoff saw, slicing machine, grinder, gaging equipment, gage blocks with accessories, granite surface plates, shop measuring instruments, optical flats and monolights, cutting tools, tool steels, cutting fluids, and lubricants. Standards services for gage calibration.

**Doerr Electric Corp.** 352
Cedarburg, Wis.

Electric motors and gearmotors (in operation on drilling and tapping units, coolant pumps and variable speed drives).

**Dow Chemical Co.** 362
1000 Main St. Midland, Mich.

Magnesium tooling materials: tooling plate and extrusions.

**Drillmation Co.** 737
21509 John R. St. Hazel Park, Mich.

Automatic drilling and tapping machines, tool control system for same.

**du Mont Corp., The** 1106
289 Wells St. Greenfield, Mass.

Keyway broaches and sets; square, hexagon and special broaches; tool bits and magnetic gage bases.

**Dumore Co., The** 678
1300 17th St. Racine, Wis.

Hand and tool post grinders, flexible shaft tools, quills, micro-drill, automatic drilling and tapping units, drill heads, fractional hp motors, carbide milling, carbide internal finishing.

**Durant Mfg. Co.** 720
Milwaukee 1, Wis.

Industrial counters: stroke, rotary, lineal measuring, predetermined, electric, photoelectric controls and tachometers; electric add and subtract counter, hispeed instrument counters.

**Eastman Kodak Co.** 911
343 State St. Rochester 4, N. Y.

Optical comparators, contour projectors, contour projector charts and fixtures.

**Eclipse Counterbore Co.** 1121
1600 Bonner Detroit 20, Mich.

Counterbores, countersinks, two-piece core drills, back spotfacers and multi-diameter cutters, carbide tipped and high-speed steel, end mills.

**Electro Arc Sales Co.** 937
P. O. Box 587 Ypsilanti, Mich.

Metal disintegrators, hand portable electric nibblers, micrometer dial indicating depth gages, etchers and demagnetizers.

See the new money-saving

# AMPCO® METAL Stock Die Blanks ... Standard Mill and Foundry Products

at the 1956 ASTE Industrial Exposition,
Booth 204, International Amphitheatre,
Chicago, Illinois
March 19 through 23rd

Here are a few reasons why: New Ampco Metal Stock Die Blanks result in longer runs, reduce scrap, and lower production costs. Everyone who makes drawn or formed parts — who uses stainless steel, galvanized steel, pickled-carbon steel, aluminum, nickel, Inconel*, Monel*, zinc, silver, tantalum and other precious metals can get better production results with Ampco Metal Dies.

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See Ampco Metal Stock Die Blanks at the ASTE Industrial Exposition in Booth 204. These and other Ampco Standard Products along with examples of Ampco Metal sand and centrifugal castings, Ampco precision wear plates, Ampco guide pin bushings, Ampco-Weld resistance welding electrodes and accessories and Ampco Bronze weldrod.

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*Trademark of The International Nickel Co.

Booth No.

**Electro-Mechano Co., The** 1228
261 E. Erie St. Milwaukee 2, Wis.

Precision drill presses and automatic drilling units.

**Elox Corp. of Michigan** 574
1830 Stephenson Hwy. Royal Oak, Mich.

Electrical discharge die sinking machine, electrical discharge form grinder, 50 amp power supply, single point tool, automatic grinding fixture.

**Enco Mfg. Co.** 651
4520-26 W. Fullerton Ave. Chicago 39, Ill.

Lathe turrets including tool posts, tailstock turrets and bed turrets; magnetic base tools, including indicator holders, lighting units and magnifiers.

**Encyclopaedia Britannica** 1011
14 E. Jackson Blvd. Chicago 4, Ill.

Research service, publications.

**Engelberg Huller Co., Inc., The** 1221
831 W. Fayette St. Syracuse, N. Y.

Abrasive belt grinding machines: centerless, conveyor, bench, platen and utility types.

**Engis Equipment Co.** 1020
431 S. Dearborn St. Chicago 5, Ill.

Diamond abrasive compounds and accessories, reciprocating hand tool for filing, lapping, honing, sawing; optical tooling equipment; electronic gages; precision gaging equipment.

**Equipto Div., Aurora Equipment Co.** 728
422 Cleveland Ave. Aurora, Ill.

Steel shelving, parts bins, drawer units, steel lockers, Other shop equipment.

**Ercona Corp., Scientific Instrument Div.** 1013
551 Fifth Ave. New York 17, N. Y.

Industrial measuring instruments, including: length measuring machines, optical dividing heads, microscopes, camshaft testing device, surface finish analyzers, optimeters, orthotests, passameters, indicating micrometers, protractor levels, optical bevel protractors, magnifiers.

**Erickson Tool Co.** 652
E. 23rd & Hamilton Ave. Cleveland 14, Ohio

Collet chucks, expanding mandrels, holders, tap chucks and related tools. Pneumatic bar feed for turret lathe, milling machine with indexer, indexers (all in operation). Full floating holders, tapping machine with floating tap holders, miscellaneous small tools.

**Esbec Barrel Finishing Corp.** 768
18 Beech St. Byram, Conn.

Tumbling barrels and tumbling bench, dimensional separator, barrel finishing compounds, abrasives.

**Falcon Tool Co.** 812
20771 Ryan Rd., P. O. Box 4605 Detroit 34, Mich.

Standard and special high-speed and carbide tipped metal cutting tools: end mills, formrelieved cutters, milling cutters, counterbores, reamers and keyway cutters, quick change toolholders and adapters.

Booth No.

**Farrand Optical Co. Inc.** 169
Bronx Blvd. & E. 238th St. New York 70, N. Y.

Automation equipment for machine tools, optical tooling equipment.

**Fawick Airflex Div., Fawick Corp.** 367
9919 Clinton Rd. Cleveland 11, Ohio

Punch press clutch and brake package conversion unit (in operation), punch press electropneumatic controls, clutches and brakes, passage seals, standard clutch package units.

**Federal Machinery Sales Co.** 392
4639 Washington Blvd. Chicago 44, Ill.

Automatic punch press feeds, hitch feeds, die feeds and feeds for punch presses, selfopening die heads, automatic stock reels; collapsing and solid adjustable taps, chasers; plug, ring and snap gages; die sets, diemakers' accessories; precision spindles, casting and laminating plastics, punches and dies, universal attachment for tapping and drilling.

**Federal Products Corp.** 496
1144 Eddy St. Providence 1, R. I.

Precision measuring instruments including: dimensional air gages, air gage plugs, rings and equipment, automatic machine control gages, automatic sorting gages, dial indicators, dial indicator gages, accessories, dimension gages, special design gages.

**Federal Tool & Mfg. Co.** 170
3600 Alabama Ave. Minneapolis 16, Minn.

Stampings (short run process).

**Fellows Gear Shaper Co., The** 544
78 River St. Springfield, Vt.

Involute measuring instrument; lead measuring instrument; liners: fine pitch (master gear), fine pitch (worm type); inspection instrument and automatic pinion checker.

**Fenn Mfg. Co., The** 346
Newington, Conn.

Wire shaping mill, turks head, rotary swaging machine.

**Fenway Machine Co.** 937
Edgemont and Clementine St. Philadelphia, Pa.

Hand portable electric nibblers.

**Ferguson Machine & Tool Co., Roller Gear Div.** 350
P. O. Box 5841 St. Louis 21, Mo.

Cam indexing mechanisms, index tables, straight line transfer machines.

**Field, William H., Inc.** 302
323 Dorchester Ave. S. Boston 27, Mass.

End mill grinder.

**Firth Sterling Inc.** 528
3113 Forbes St. Pittsburgh 30, Pa.

Electrical discharge tool sharpener, tool and die steels, special alloys and metals, carbides, tools, blanks, inserts and mechanically held tools, die material, borides.

Booth No.

**Flynn Mfg. Co.** 500
133 Flowerdale Ferndale 20, Mich.

Boring head and boring bars.

**Furane Plastics, Inc.** 165
4516 Brazil St. Los Angeles 39, Calif.

Metal parts formed with plastic faced dies, various plastic jigs and fixtures, various packaging systems, tooling plastics.

**Gaertner Scientific Corp., The** 1126
1201 Wrightwood Ave. Chicago 14, Ill.

Toolmakers' microscopes, measuring microscopes, comparators, machine divided scales, optical height gages, small shop microscope, telescopes, cathetometers.

**Gairing Tool Co., The** 1519
21221 Hoover Rd. Detroit 32, Mich.

Standard and special cutting tools and toolholders including counterbores and countersinks, drills, boring bars, drill heads, mills, carbide insert turning tools, and blade locks; oil inductors.

**Galland-Henning Mfg. Co.** 328
2753 S. 31st St. Milwaukee 46, Wis.

Air and hydraulic cylinders; hand, foot and electrically operated air valves; pilot operated valves; hydraulic valves; speed control valves.

**Gammons-Hoaglund Co., The** 907
395-405 Main St. Manchester, Conn.

Helical reamers: taper pin, die maker's hand, chucking, taper, welding special and duplex reamers in various designs.

**Garlock Packing Co., The** 560
402 Main St. Palmyra, N. Y.

Mechanical packings, including fibrous, rubber, metal types; mechanical seals, plastics, silicones; expansion joints, gaskets.

**General Box Co.** 1600
1825 Miner St. Des Plaines, Ill.

Wire-bound crates and boxes, pallet boxes.

**General Electric Co.** 1440
General Purpose Control Dept. Bloomington, Ill.
Medium Induction Motor Dept. Schenectady, N. Y.

General purpose controls. Medium induction motors. See also Carboloy Dept.

**General Industrial Diamond Co., Inc.** 810
611-21 Broadway New York 12, N. Y.

Diamond wheel dressing tools, shaped diamond tools, impregnated diamond tools, diamond thread grinding tools, diamond cluster tools, hardness tester, diamond tools, diamond wheels, hones, industrial diamonds, lens generator laps, diamond powder, core drills, centerlaps, diamond blades.

**Gerotor May Corp.** 750
Maryland Ave. and Oliver St. Baltimore 3, Md.

Hydraulic variable speed transmissions, hydraulic pumps and motors, pneumatic bin evacuating devices, contract manufacturing.

Booth No.

**Giant Grip Mfg. Co.** 203
29 Osceola St. Oshkosh, Wis.

Drop forgings in carbon, alloy, stainless steel and aluminum, heat treating, tools, dies, jigs and fixtures, production machining, magnafluxing, shot blasting.

**Giustina Corp. of America** 716
120 Wall St. New York 5, N. Y.

Universal hydraulic grinders.

**Govro-Nelson Co., The** 1226
1931 Antoinette St. Detroit 8, Mich.

Automatic drilling and tapping units.

**Graham Machine Tool Co.** 1621
19 Cleveland Pl. New York 12, N. Y.

Vertical milling machine, universal milling machine, hydraulic surface grinder, ram type milling machine.

**Gray Equipment Co.** 1225
13600 Ford Rd. Dearborn, Mich.

Air-powered, Geneva-motion index table; hopper feed equipment.

**Graymills Corp.** 360
3705 N. Lincoln Ave. Chicago 13, Ill.

Centrifugal and gear type pumping units, portable coolant systems, agitating pumping systems, metal-cleaning equipment, lubricating equipment.

**Grobet File Co. of America, Inc.** 657
Carlstadt, N. J.

Files, countersinks, burrs.

**Guthery Machine Tool Corp.** 420
38-31 Crescent St. Long Island City 1, N. Y.

Single spindle automatic screw machines, spot-welders.

**Hammond Machinery Builders, Inc.** 675
1600 Douglas Ave. Kalamazoo, Mich.

Electrolytic chip breaker grinder, electrolytic carbide tool grinder, mist collector, drill and tap grinder, abrasive belt grinder, carbide tool grinder, dust collector, dustless grinder.

**Handy & Harman** 275
82 Fulton St. New York 38, N. Y.

Silver brazing alloys, flux. Alloy brazing (in operation).

**Hanna Engineering Works** 365
1765 Elston Ave. Chicago 22, Ill.

Low pressure air and hydraulic cylinders and control valves, high pressure hydraulic cylinders.

**Hannifin Corp.** 158
501 S. Wolf Rd. Des Plaines, Ill.

Air and hydraulic cylinders; air cylinder control valves, accessories: general purpose regulators, filters and lubricators.

Booth No.

**Hansford Mfg. Corp.** 1232
1239 University Ave. Rochester 7, N. Y.
Die handlers for separating and positioning dies.

**Hanson-Whitney Co., Div. of The Whitney Chain Co.** 163
169 Bartholomew Ave. Hartford 2, Conn.
Thread taps, multiple thread milling cutters, fine pitch gear hobs, thread plug and ring gages, thread comparator gages, optical tap hook checker, precision ground lead screws.

**Harco Engineering** 756
12092 Woodbine Ave. Detroit 39, Mich.
Jig and fixture clamps and details: cams, knobs, hook clamps, buttons, clamp rests, pins, keys, jig legs, handwheels, machine handles, clamp straps, spring plungers, pads, spring jacks and stops.

**Hardinge Brothers, Inc.** 452
1420 College Ave. Elmira, N. Y.
Toolroom machines: toolroom lathes; milling machine; production machines: second operation machine, chucking machines, lathe; collet chucks, index fixtures and related accessories.

**Harig Mfg. Corp.** 1718
5757 W. Howard St. Chicago 31, Ill.
Carbide and tool steel dies, grinding fixtures.

**Harman, F. Ward, Associates** 1128
Halesite, L. I., N. Y.
Scale models; plant layout equipment, 2 and 3 dimensional.

**Harrison, T. S., & Sons, Ltd.** 415
Union St., Heckmondwike Yorks, Eng.
General purpose lathes, copying lathe, universal milling machine, horizontal milling machine, radial drilling machine.

**Haskins, R. G., Co.** 561
2651 W. Harrison St. Chicago 12, Ill.
Air turbine grinder, flexible shaft grinders, screwdriving equipment.

**Hause Engineering** 246
809 S. Pleasant Montpelier, Ohio
Double end drilling machine, vertical mounted drill unit, deep hole drilling machine.

**Haynes Stellite Co., Div. Union Carbide and Carbon Corp.** 931
725 S. Lindsay Kokomo, Ind.
Special alloys, investment-cast parts, cast alloy metal-cutting tools, hard-facing rods in cast, extruded, tube rod and coils. Cobalt-base, nickel-base, iron-base alloys, and cast tungsten carbide.

**Heinrich Tools Inc.** 788
1536 Clark St. Racine, Wis.
Holding devices for production: drill press vise and fixture base, fixture lock, band saw vise, safety drill vise, air vises, air clamp and air accessories, drill press vise, shears, nibblers, punchers, rod cutters.

Booth No.

**Heintz Mfg. Co.** 129
Front & Olney Aves. Philadelphia 20, Pa.
Cold formed products, metal stampings and assemblies, tools, dies and fixtures.

**Heller Tool Co.** 256
Heller Dr. Newcomerstown, Ohio
File cutting machine.

**Herman Stone Co., The** 142
1860 N. Gettysburg Ave. Dayton 7, Ohio
Granite surface plates.

**Hillyer Instrument Co., Inc.** 1200
54 Lafayette St. New York 13, N. Y.
Automatic locating and drilling machine, automatic positioning equipment, multiple channel tape programmer.

**Hirschmann, Carl, Co., Inc.** 101
30 Park Ave. Manhasset, N. Y.
Small twist drill grinding machine, Swiss type automatic lathe.

**Hitchcock Publishing Co.** 282
Wheaton, Ill.
Publications: *Machine and Tool Blue Book, Grinding and Finishing and Woodworking Digest, Machine and Tool Directory.*

**Hofmann Engineering Co.** 1714
5601 S. Crawford Ave. Chicago 29, Ill.
Plastic air hose, detachable couplers and fittings, air-craft, hydraulic and refueling couplings, valves, cylinders and valve-in-head cylinders.

**Hoglund Engineering & Mfg. Co., Inc.** 205
Snyder Ave. Berkeley Heights, N. J.
Contour wheel dressers.

**Hole Engineering Service** 185
21100 Collingham, P. O. Box 4877
Redford Sta., Farmington Twp. Detroit 19, Mich.
External and internal bearing-izing machines for sizing and burnishing bearing surfaces; drilling unit, boring unit.

**Horton Chuck Div., The E. Horton & Son Co.** 764
Canal Bank Windsor Locks, Conn.
Chucks: lathe, J-type pinch type, and chuck jaws.

**Howe & Fant, Inc.** 575
20 Fitch St. East Norwalk, Conn.
Turret drilling and tapping machines and attachment, universal jig base, other accessories and tooling for turret drilling and tapping.

**Hudson Automatic Machine & Tool Co.** 940
3710 Hudson Ave. Union City, N. J.
Swiss-type automatics, cam milling attachment, cam tracing apparatus, combination tool grinding and lapping machine.

# NELCO CARBIDE TIPPED END MILLS... OUT IN FRONT WITH SPEED, PERFORMANCE, ECONOMY!

**Engineered with the quality features that make end milling jobs pay off**

Engineered with the hardest practical grade of carbide to "breeze" through the toughest metal cutting applications.

Nelco end mills are precision ground all over—from shank to cutting edge.

174 different end mills—diameters from ⅛" to 5"—2, 3, 4, or 6 flutes—straight or taper shank—a tool for every application!
Specific cutting angles are engineered for each size and series of tools assuring smooth, prolonged performance on all materials. Primary and secondary clearance angles on the carbide produce the strongest cutting edge ever devised with clearances sufficient to operate at high speed.

The complete Nelco end mill line means a tool for *every job*—from stock—without the delay and cost of a "special".

Your equipment relies on its tooling for production—and in *any* machine—new or old—Nelco carbide tipped tools really PRODUCE!

**Send today for the new Nelco catalog—over 850 tools. 850 ways to better production at less cost.**

## NELCO TOOLS

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SLAB MILLS
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BORING BARS
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SPECIAL TOOLS
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SLITTING SAWS
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CUTTER ARBORS
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HALF SIDE MILLS
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CUTTER ADAPTERS
•
KEYSEAT CUTTERS
•
DIAMOND WHEELS
•
SHELL END MILLS
•
TRI-HELIX FACE MILLS
•
HARDENED STEEL DRILLS
•
FINE PITCH FACE MILLS
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2 FLUTE DOUBLE END SOLID CARBIDE END MILLS
•
4 FLUTE DOUBLE END SOLID CARBIDE END MILLS
•
3 FLUTE CARBIDE TIPPED CENTER CUTTING END MILLS
•
No. 50 TAPER SHANK END MILLS
•
INSERTED BLADE FACE MILLS
•
GRINDER AND LATHE CENTERS
•
TRI-HELIX SIDE MILLING CUTTERS
•
2 FLUTE CARBIDE TIPPED END MILLS
•
2 FLUTE SOLID CARBIDE END MILLS
•
3 FLUTE CARBIDE TIPPED END MILLS
•
4 FLUTE CARBIDE TIPPED END MILLS
•
4 FLUTE SOLID CARBIDE END MILLS
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5 FLUTE CARBIDE TIPPED END MILLS
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6 FLUTE CARBIDE TIPPED END MILLS
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TYPE C SHELL MILLING CUTTER ARBORS
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*For that EXTRA Edge in Production!*

# NELCO TOOLS

**NELCO TOOL CO., Inc. • Manchester, Connecticut**

Booth No.

**Huebner Publications, Inc.** 266
1975 Lee Rd. Cleveland 18, Ohio

Publications: *Tooling & Production* magazine, technical books.

**Hunt, C. B., & Son, Inc.** 141
1900 E. Pershing St. Salem, Ohio

Air and hydraulic control valves, air and hydraulic couplings.

**Huron Machine Products, Inc.** 1029
6252 Monroe Blvd. Dearborn, Mich.

Gage handles, blanks and bushings, gage locking assemblies, holders, disk blanks and insulator grips, cutting compound.

**Hydro-Line Mfg. Co.** 321
5600 Pike Rd. Rockford, Ill.

Air and hydraulic cylinders, counterbalance cylinders.

**Ideal Industries, Inc.** 659
Sycamore, Ill.

Live centers, electric etchers, demagnetizers, resistance soldering equipment, electric tachometers.

**Illinois Metal Products** 1712
429 W. Superior St. Chicago 10, Ill.

Milling machine vises.

**Index Machine Co.** 791
543 N. Mechanic St. Jackson, Mich.

Milling machines: high-speed vertical and horizontal, precision rotary tables, milling machine vises, measuring equipment, accessories and attachments for milling machines.

**Industrial Diamond Association of America, Inc.** 520
Box 175-589 Turnpike Pompton Plains, N. J.

Diamond dressing and truing tools, grinding wheels and hones, saws, boring and turning tools, coring bits, oil well bits, blast hole bits, wire drawing dies, abrasive powders, compounds, drills, shaped tools, scribers and engraving tools, oil well drills; technical material on diamond products, turning demonstration with diamond tools, demonstration of shaping abrasive wheels with diamond tools.

**Industrial Tectonics, Inc.** 1100
3684 Jackson Rd. Ann Arbor, Mich.

Ballizing operation, production sizing of internal diameters (in operation); ballizing sets, precision master ball sets; modified balls; precision balls.

**Ingersoll-Rand Co.** 345
11 Broadway New York, N. Y.

Torsion bar, pneumatic torque control tools, pneumatic multiple nut runners, pneumatic angle drills, air motors, pneumatic screwdrivers, pneumatic grinders, nail drivers, angle wrenches.

**Inspection Devices Co.** 1231
5636 S. Lake Park Ave. Chicago 37, Ill.

Dial bore gages.

Booth No.

**International Research & Development Corp.** 1026
797 Thomas Lane, P. O. Box 1707 Columbus 16, Ohio

Vibration analyzers, portable dynamic balancers, balancing machines.

**Iron Age** 1531
100 E. 42nd St. New York 17, N. Y.

Publications.

**Jarvis Corp.** 1401
Stack St. and Pease Ave. Middletown, Conn.

Tapping attachments, taps, multiple tapping and drilling heads with adjustable and fixed spindles, rotary files, flexible shafts and machines, carbide tools: boring tools and bits, center laps, countersinks, cutters, drills, grinding tools, mills, router, reamers.

**Jergens Tool Specialty Co.** 401
712 E. 163 St. Cleveland 10, Ohio

Standard jig and fixture components: handwheels, hand knobs, chuck jaw blanks, clamping levers, etc.

**Jerico (J. R. Reinertson & Co.)** 240
4744 W. Lake St. Chicago 44, Ill.

Pivot punches and die buttons, punch and die tooling units with special press, drill grinder, drill point gage; mist coolant systems, drill chucks, driving and live centers, pencil grinder, mist filter-lubricators, carbide burs and end mills, air compressors, cold-molding metal compounds, compound angle vise.

**Jerpbak Bayless Co.** 1031
Solon Rd. Solon, Ohio

Lead comparator, wheel crusher rolls, wheel crusher units, thread gages, thread milling cutters, comparator gages, worm face gear grinding wheels, miscellaneous thread ground products, taps.

**Jiffy Disintegrator Inc.** 200
109 E. Nine Mile Rd. Ferndale 20, Mich.

Disintegrating machines, level and angle finder.

**Jig Bushing Co., The** 1103
454 N. Cass Ave. Pontiac 17, Mich.

Drill jig bushings, aluminum and bronze bushings, precision parts.

**Johansson, C. E., Gage Co.** 1217
10641 Haggerty Ave. Dearborn 1, Mich.

Surface finish interferometer and portable surface finish instruments; pneumatic and machine control automation gages; comparators, gage blocks and accessories; micrometers; internal gages, thread gages.

**Johansson, I. O., Co., The** 1719
7730 Austin Ave. Skokie, Ill.

Radial, box column, multiple spindle.

**Johnson Gage Co., The** 926
534 Cottage Grove Rd. Bloomfield, Conn.

Comparators for external and internal threads, threat snap gages, segment and roll type. Thread plug and ring gages, setting masters, special gages and comparators, comparator and master for turbine blades.

Booth No.

**Jones & Lamson Machine Co.** 497
Clinton St. Springfield, Vt.

Optical comparators, comparator charts and fixtures, automatic opening threading dies and chasers.

**Jones & Laughlin Steel Corp.** 1606
3 Gateway Center Pittsburgh 30, Pa.

Special shaped steel bars.

**Jones & Shipman (Canada) Ltd.** 425
130 Elmslie St., Ville La Salle Quebec, Canada

Tool and cutter grinder, surface grinder, universal grinder, carbide tool grinder, slotting mill.

**K-P National Sales** 1717
1036 Terrace St. Muskegon, Mich.

Measuring equipment.

**Kalamazoo Tank & Silo Co., Machine Tool Div.** 639
500 Harrison St. Kalamazoo 16, Mich.

Horizontal metal-cutting bandsaw, bar feed.

**Karniotis Precision Products Inc.** 1033
14827 Heyden Detroit 23, Mich.

Indexing and grinding fixture, sine plates, planer.

**Kaydon Engineering Corp., The** 268
McCracken St. Muskegon, Mich.

Ball and roller bearings, taper roller bearings, needle bearings, special bearings.

**Kenco Mfg. Co.** 618
5211 Telegraph Rd. Los Angeles 22, Calif.

Rotary tables, milling vises, punch presses.

**Kennametal, Inc.** 475
Lloyd Ave. Latrobe, Pa.

Carbide tools, tips, dies, carbide tipped cutting tools and specialties, brazed tools and mechanically held insert type tooling, carbide wear parts and components.

**Keuffel & Esser Co.** 524
300 Adams St. Hoboken, N. J.

Optical tooling equipment, dimensionally stable drafting and scribing medium, sensitized metal templates.

**King Punch Co.** 712
3314 W. Chicago Ave. Chicago 51, Ill.

Die buttons, solid and split; piercing dies and punches; quills, pilots, special punches.

**Koebel Diamond Tool Co.** 209
9456 Grinnell Ave. Detroit 13, Mich.

Diamond dressing tools, diamond formed and lapped tools, diamond drills, cemented diamond particles dressing tools and products.

**Kolcast Industries Inc.** 1110
36101 Euclid Ave. Willoughby, Ohio

Stainless alloy steel investment castings, specialized large castings, production castings, frozen mercury patterns.

Booth No.

**Lamina Dies and Tools, Inc.** 562
14925 W. 11 Mile Rd. Oak Park 37, Mich.

Guide pins and bushings.

**Landis Machine Co.** 578
Waynesboro, Pa.

Thread-cutting die heads, collapsible taps, solid adjustable taps, thread rolling attachments.

**Lapeer Mfg. Co.** 553
3052 Davison Rd. Lapeer, Mich.

Toggle action clamps, pliers and wrenches, manual and air-operated; heavy-duty models.

**Latrobe Steel Co.** 451
2626 Ligonier St. Latrobe, Pa.

Self-lubricating HS steels, free machining die steels.

**LeCount Tool Works, Inc.** 1107
390 Capitol Ave. Hartford, Conn.

Expanding arbors and mandrels.

**Lee, K. O., Co.** 187
First Ave. S.E. at Congress Aberdeen 1, S. D.

Universal, tool and cutter grinders, carbide chip breaker grinders; accessory fixtures and work-holding attachments, arc welders, drill chucks, expanding mandrels, abrasive wheel dressers, adjustable reamers, reamer drive.

**Lees-Bradner Co., The** 424
12120 Elmwood Ave. Cleveland 11, Ohio

Single point semiautomatic threading machines, tool lapping machine.

**Lehmann Boring Tool Co., Div. of Fulton Iron Works Co.** 213
4389 Duncan Ave. St. Louis 10, Mo.

Boring bars, adjustable block cutters, solid block cutters, stellite tungsten carbide-tipped cutter blades, boring tool.

**Lempco Industrial, Inc.** 519
5490 Dunham Rd. Bedford, Ohio

Ball-bearing die set, hydraulic arbor presses, crane, adjustable reamers, surface grinder.

**Lindberg Engineering Co., High Frequency Heating Div.** 1201
2321 W. Hubbard St. Chicago 12, Ill.

Induction heating unit (in operation).

**Linde Air Products Co., Div. of Union Carbide and Carbon Corp.** 931
30 E. 42nd St. New York 17, N. Y.

Carbide plating on turbine engine seals, core rods, cold form dies, pump bushings, feed and gripping dogs, aluminum rockers arms, anvil blocks, wire forming mandrils, paper drills, industrial knives.

**Littell, F. J., Machine Co.** 589
4127 N. Ravenswood Ave. Chicago 13, Ill.

Roll feeds, reels, feeding and straightening machines, air-vacuum safety devices.

Booth No.

**Lodding Inc.** 735
73 Beacon St. Worcester 1, Mass.

Jig and fixture components, automatic and semi-automatic clamps.

**Logan Engineering Co.** 900
4900 W. Lawrence Ave. Chicago 30, Ill.

Vertical milling machine, screw cutting lathes, turret lathes, shaper, sheet metalworking tools.

**Logansport Machine Co., Inc.** 245
Logansport, Ind.

Air and hydraulic chucks, cylinders, valves and presses.

**Lovejoy Tool Co., Inc.** 184
133 Main St. Springfield, Vt.

Standard and special milling cutters, slotting and side milling cutters; adaptor arbors; adaptor flywheels; carbide blade end mills (in operation).

**Lowerator Div., American Machine & Foundry Co.** 153
261 Madison Ave. New York 16, N. Y.

Industrial work positioner.

**Lufkin Rule Co., The** 598
Saginaw, Mich.

Precision tools, measuring tapes and rules.

**M-B Products** 557
46 Victor Ave. Detroit 3, Mich.

Pneumatic grinders, air line filters, automatic air line lubricators, regulators, air traps.

**M.B.I. Export & Import Ltd.** 563
475 Grand Concourse Bronx 51, N. Y.

Precision horizontal optical jig borer, multipurpose vises, tapping attachments, chucks calipers.

**Machinery, (The Industrial Press, Publishers)** 1239
93 Worth St. New York 13, N. Y.

Publications.

**Mac-it Screw Div., Strong, Carlisle & Hammond Co.** 906
1392 W. 3rd St. Cleveland 13, Ohio

Fasteners including: socket head cap screws, setscrews, tool post screws; special screw machine and cold upset parts.

**Madison Mfg. Co.** 1209
1713 7th St. Muskegon, Mich.

Rough boring tools, finish boring tools, special boring tools, multiple cutter boring bars, grinding fixtures, grinding arbors, specialized boring tooling, gun drills, deep hole drills, trepanning tools, coolant system, boregages, spade and core drills, roller burnishing tools.

**Magnaflux Corp.** 820
7300 W. Lawrence Ave. Chicago 31, Ill.

Magnetic particle testing; Zyglo and fluorescent penetrant inspection fluids; magnetic electronic instruments (in operation).

Booth No.

**Mall Tool Co.** 738
7740 S. Chicago Ave. Chicago 19, Ill.

Pneumatic grinders, sanders, polishers, buffers, drills, screwdrivers, pneumatic and electric impact wrenches, chain and circular saws.

**Man-Au-Cycle Corp. of America** 614
132 53rd St. Brooklyn 32, N. Y.

Threading lathe.

**Manco Mfg. Co.** 708
Bradley, Ill.

Portable hydraulic rod straighteners, cutters, angle iron cutter, punches, riveters, presses.

**Marathon Die Set Corp.** 1821
3521 Armitage Ave. Chicago 41, Ill.

Die sets, bushings, leader pins, die springs, drill jigs drill jig bushings, perforators.

**Martin Engineering Co.** 761
Drawer D Neponset, Ill.

Rotary pneumatic vibrator type, tunable reed tachometer, core box protection devices.

**Marvel Engineering Co.** 1028
7227 N. Hamlin Ave. Chicago 45, Ill.

Sump line liquid filters for hydraulic oils, fire-resistant hydraulic fluids, coolants, lubricants.

**Maserati Corp. of America**
662 Main St. Westbury, L. I., N. Y.

Surface grinder, radial drill, toolroom lathe, metal band saw, 3-D engraver, vertical turret mill, universal mill.

**Master Chemical Corp.** 1133
13 N. Huron St. Toledo 1, Ohio

Cutting and grinding fluids, mist coolant.

**Master Pneumatic Tool Co., Inc.** 608
Krick Rd. Bedford, Ohio

Portable air tools: chipping hammers, sand rammers, drills, nutsetters, vertical and horizontal grinders, impact wrenches, sanders, buffers, wire-brushing tools.

**Matthews, Jas. H., & Co.** 662
3942 Forbes St. Pittsburgh 13, Pa.

General purpose marking machine, automatic dial feed marking machine, rotary high production marking machine, offset bar and tube printer machine, blast-etch marking machine, marking tools and dies, tag embossing equipment.

**Mayline Co. Inc.** 1036
619 N. Commerce Sheboygan, Wis.

Drafting room furniture and equipment.

**McCrosky Tool Corp.** 1117
1341-1357 S. Main St. Meadville, Pa.

Inserted blade cutting tools: reamers, milling cutters, boring bars and special tools. Machine tool attachments: quick-change chucks and collets, turret toolposts.

## *Talking About Die Sets*

*with*
**Phil Marsilius**
*Vice-President*
*The Producto Machine Co.*

**"Tooling for Tomorrow"**—This month's ASTE Exposition in Chicago offers you an opportunity to find out whether your tooling practices and facilities are keeping pace with the many technological advances being made throughout industry. You will be able to see the latest tooling developments on display in more than 450 exhibits.

**Major die set advances** have been made since the last Tool Show and many of the leading die set manufacturers will be exhibiting them at the International Amphitheatre. "Tooling for Tomorrow" includes radical changes in the design, appearance, performance and accuracy of die sets and their components; new lubrication methods; and numerous new die accessories. The Tool Show is a rare occasion for you to inspect, compare and select the developments best suited to your particular die set requirements.

**Related diemaking equipment,** of course, will be displayed along with thousands of other products intended to improve your manufacturing operations. The editorial pages of this magazine give you an excellent preview of some of the outstanding tools, machines, materials and processes to be demonstrated for the first time in Chicago on March 19-23.

**You will also want** to attend a number of the ASTE technical sessions. Such vital topics as "Plastic Tooling Challenges the Tool Engineer" and "Solving Carbide Die Problems" are on the well-balanced program. And you can choose from 12 conducted tours to plants in the Chicago area.

**If you have not yet** made plans to attend the ASTE Exposition, we urge you to do so. We cordially invite you to stop at Booth 396 for a personal chat about die sets.

***Try Our "Blindfold Test" at the Show and See How:***

# PRODUCTO'S NEW DIE SET CAN ASSEMBLE ITSELF!

Yes, it's true. An ingenious guide pin design feature, new and exclusive with Producto, enables the die set to practically assemble itself. You can test it in Booth 396 at the ASTE Show in Chicago. *We guarantee you will be able to assemble the set blindfolded ...using just one hand!*

This is a real boon to the man on the bench. For him, a Producto die set means no more fussing to line up pins and bushings...no more need to hammer punch holder down on pins. He can start the punch holder on straight or at any angle...*and the die set puts itself together.* It never cocks, never jams.

While this new feature is special to a particular line of pins—available from all Producto warehouses soon after the Show—*all* Producto guide pins have been improved with greater press fit lengths, smoother end radii and mirror-like surface finish of 7-9 micro-inches.

Producto's new pins and new bushings* are added reasons you should call your nearest Producto branch for precision die sets...fast. Be sure to see these important developments in Booth 396 at the ASTE Show.

**Featured in current* Die Set Digest *with other valuable data for the diemaker and user. Write today for your free copy.*

THE PRODUCTO MACHINE COMPANY
930 Housatonic Avenue, Bridgeport 1, Connecticut
Telephone: FOrest 7-8675

***For prompt die set service, 'phone these PRODUCTO assembly warehouses:***

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| Atlanta | CY 7667 | Detroit | LI 6-7600 | Newark | MI 2-1773 |
| Chicago | ES 8-3307 | Kansas City | BA 9033 | Philadelphia | MO 4-1010 |
| Cleveland | SU 1-6158 | Los Angeles | TR 9826 | Rochester | GL 1810, GL 5357 |
| Dayton | MU 1651 | New York | WO 4-7484 | St. Louis | FR 1-3370 |

or check Yellow Pages in any other stamping center for distributors stocking PRODUCTO.

***Produce More With***

**PRODUCTO**

***Precision Die Sets***

Booth No.

**Mead Specialties Co.** 215
4114 N. Knox Ave. Chicago 41, Ill.

Air-hydraulic drill press feed, rotary table, air presses, air impact hammer, air vises, air cylinders and valves, abrasive belt grinding machine, air and electropneumatic timers.

**Melard Mfg. Corp.** 1009
432 Austin Pl. New York 61, N. Y.

Coolant-aerator.

**Merrill Engineering Laboratories** 125
1240 Lincoln St. Denver 3, Colo.

Industrial balancers.

**Metal Carbides Corp.** 1300
107 E. Indianola Ave. Youngstown 7, Ohio

Carbide cutting tools, tool tips, draw dies, centerless grinder blades, drill jig bushings, lathe centers, plug and ring gages; sandblast nozzles, rolling mill work rolls, toolholders; high-density alloy, diamond wheel dressers, diamond grinding wheels.

**Metal Cutting Tools Inc.** 1143
301 S. Water St. Rockford, Ill.

Standard and special end cutting tools, holders, pilots, drivers, collar holders, stop nut holders.

**Metal Lubricants Co.** 666
3211 S. Wood St. Chicago 8, Ill.

Cutting oils, soluble cutting and grinding fluids, quenching oils, deep drawing compounds, rust preventives, tapping compounds, metal cleaners, high and low temperature greases, demonstrations.

**Metal Removal Co., The** 617
1801 W. Columbia Ave. Chicago 26, Ill.

Resinoid grinding wheels and mounted points, abrasive contour disks, mounted and straight wheels, carbide burrs, internal tools and end mills, HSS end mills and rotary files, grinding wheels and disks.

**Metalworking Publishing Corp.** 734
172 S. Broadway White Plains, N. Y.

Publication: *Metalworking.*

**Micrometrical Mfg. Co.** 774
345 S. Main Ann Arbor, Mich.

Profilometer, anderometer, wavometer, proficorder.

**Micro-Poise Engineering & Sales Co.** 642
14851 Grand River Ave. Detroit 27, Mich.

Production precision balancing machines.

**Milford Rivet & Machine Co., The** 453
857 Bridgeport Ave. Milford, Conn.

Cold formed special parts and fasteners, semi-tubular rivets, rivet setting machines.

**Miller Fluid Power Co.** 429
2040 N. Hawthorne Ave. Melrose Park, Ill.

Accumulators, boosters, air cylinders, counterbalance cylinders, hydraulic cylinders, seals.

Booth No.

**Model Machine Co., Inc.** 739
4729 Hawthorne St. Philadelphia 24, Pa.

Automatic nut chamfering machine, deburring machines.

**Modern Devices** 533
P. O. Box 429 Libertyville, Ill.

Automatic grinding chucks, centerless grinding fixture.

**Modern Industrial Engineering Co.** 613
14230 Birwood Ave. Detroit 38, Mich.

Automated gear chamfering machines, gear tooth grinding machine, spline chamfering machine, pressure testing machine.

**Modern Machine Shop (Gardner Publishing Inc.)** 685
431 Main St. Cincinnati 2, Ohio

Publications.

**Modernair Corp.** 237
400 Preda St. San Leandro, Calif.

Fluid power equipment: valves, cylinders, compressors, pumps etc. Three-way air valves, three and four-way solenoid valves, air cylinders.

**Mohawk Tools, Inc.** 777
910 E. Main St. Montpelier, Ohio

Cutting tools.

**Monray Corp.** 1033
24619 W. Warren Ave. Dearborn, Mich.

Form radius dressers.

**Moore Products Co.** 624
H & Lycoming Sts. Philadelphia 24, Pa.

Pneumatic comparator gages, ID grinder size control, OD grinder gage with feedback control, automation gaging station, production lead testing.

**Moore Special Tool Co., Inc.** 1430
740 Union Ave. Bridgeport 7, Conn.

Universal measuring machine, boring chuck set, rotary table, sine plate, motorized centers and other hole location accessories.

**Morrison Engineering Co.** 332
937 W. Lake St. Chicago 7, Ill.

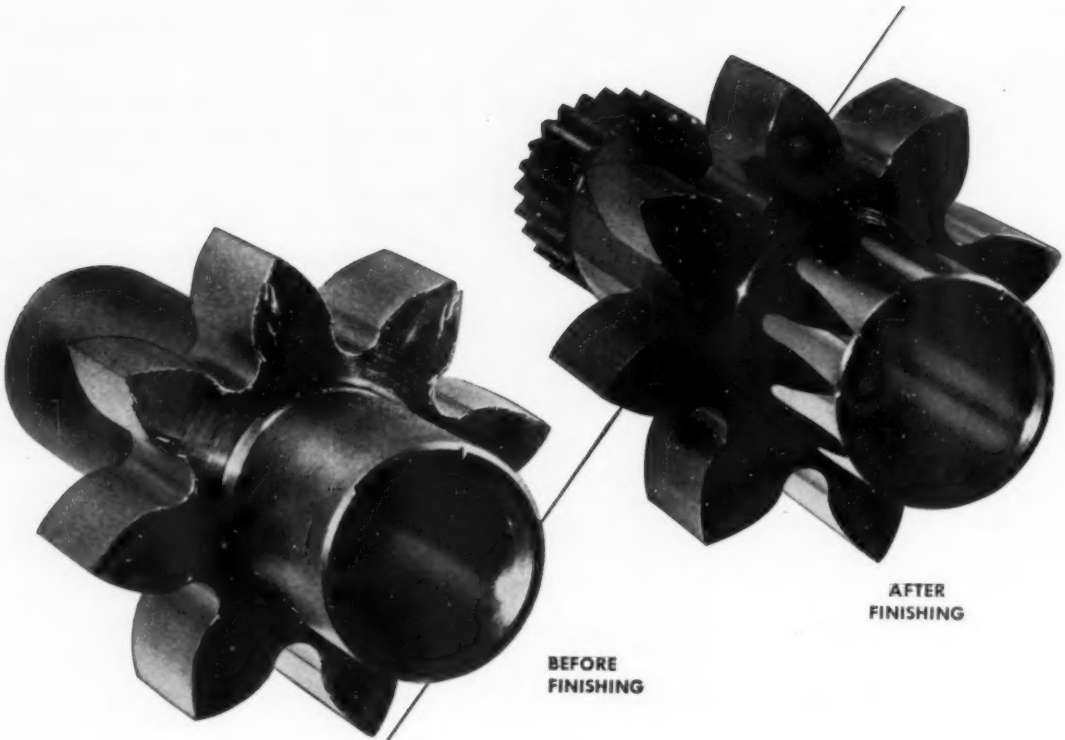
Combined vertical and horizontal milling machine, cross-slide rotary table, regulator.

**H. E. Morse Co.** 1010
455 Douglas Rd. Holland, Mich.

Process gages and comparoscope.

**Motch & Merryweather Machinery Co., The** 1021
1250 E. 222nd St. Cleveland 17, Ohio

Segmental blades, solid H.S.S. cutoff saw blades, slitting saws, face milling cutters and shell end mills, cutting and grinding coolants, circular knives, dual drive adaptors.

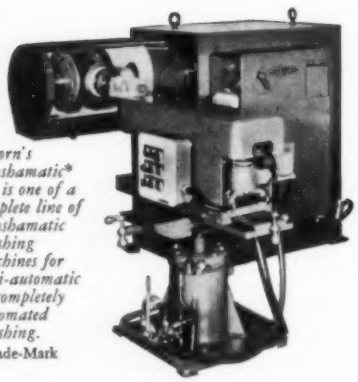


AFTER FINISHING

BEFORE FINISHING

# Finished to run without a . . .

# drop of oil



*Osborn's Brushamatic* 3A is one of a complete line of Brushamatic finishing machines for semi-automatic or completely automated finishing.*

*Trade-Mark

MORE precise finishing of parts is vital to the continuing improvements in jet aircraft components. Fuel pump gears, shown above, are an example.

Unlike the original oily, kerosene-type fuels, today's jet fuel has extremely low lubricating quality. Brushing to remove burrs—blend surfaces and edges of teeth—is an important early step in producing the micro-finish that permits fuel pump gears to run at speeds to 3500 rpm, under pressures to 900 psi . . . without lubrication. Higher finishes are also reducing torque, greatly increasing equipment service life.

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BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

Booth No.

**National Broach & Machine Co.** 816
5600 St. Jean Ave. Detroit 13, Mich.

Broaching tools, broaching fixtures, broaching toolholders, gear laps, gear shaving cutters, gear measuring machines, gear sound testing machines, precision gears.

**National Fluid Power Association** 238
1618 Orrington Ave. Evanston, Ill.

Publications.

**Neill & Co., James (U.S.A.) Ltd.** 797
37-39 Pearl St. New York 4, N. Y.

Hacksaw blades and frames, engineers' tools, magnetic tools and permanent magnets.

**Neise, Karl A.** 162
404 Fourth Ave. New York 16, N. Y.

Universal facing and boring head, trepanning tool, circular dividing equipment, all-purpose vise, toolmakers' machine vises, gripping claws, watchmakers, instrument makers and toolmakers' lathes, disk springs (Belleville type), measuring instruments.

**Nelco Tool Co., Inc.** 778
266 Center St. Manchester, Conn.

Carbide-tipped cutting tools, arbors, H.S.S. forged tools.

**Nelson Stud Welding, Div. Gregory Industries** 628
E. 28th St. & Toledo Ave. Lorain, Ohio

Stud welding equipment and end welding studs.

**New England Machine & Tool Co., The** 461
913 Farmington Ave. Berlin, Conn.

Airfoil milling machine, cam milling machine.

**New Hermes Engraving Machine Corp.** 166
13-19 University Pl. New York 3, N. Y.

Portable and bench type pantograph engraving machines with electric arc etching equipment (in operation).

**New York Belting & Packing Co.** 1307
1 Market St. Passaic, N. J.

Timing belt drives.

**Nichols-Morris Corp.** 351
76 Mamaroneck Ave. White Plains, N. Y.

Miller,toolroom miller, semi automatic millers, twin mill, dividing head, miller accessories.

**Nicholson File Co.** 157
23 Acorn St. Providence 1, R. I.

Hand steel files and rasps, rotary power files and HSS and carbide burs.

**Nikon Inc.** 1716
251 Fourth Ave. New York 10, N. Y.

Shadowgraphs, optical comparator, surveying instruments, microscopes, photo copying equipment, optical measuring instruments.

Booth No.

**Nilsson Gage Co., Inc.** 717
19 W. 44th St. New York 36, N. Y.

Dial snap gages, dial bore gages, dial groove gages, dial groove location gages, dial indicators, dial layout gages, plain plug and ring gages, thread plug and ring gages, surface plates.

**Noble & Westbrook Mfg. Co., The** 767
East Hartford 8, Conn.

Roll marking machines, roll graduating machine for dials, collars, etc., dial marking machines, hand numbering device, automatic numbering heads, steel marking dies, hand type holder.

**Norgren, C. A., Co.** 325
3400 S. Elati St. Englewood, Colo.

Air filters and regulators, attachments and accessories for machine tools, pneumatic controls, coolant systems, lubrication equipment, pneumatic devices, pressure regulators.

**North American-Viking Drill Co.** 1101
470 Kittson St. St. Paul 1, Minn.

H.S. twist drills and taps.

**Northwestern Tool & Engineering Co.** 301
117 Hollier Ave. Dayton 3, Ohio

Work clamping tools: step block and clamp sets, T-nut and stud sets, punch press sets, step block sets, strap and step clamps. Jig and fixture components: toggle shoe clamps, V-pads, fixture keys, jig feet, latch bolts, special screws, nuts, studs and washers.

**Nupla Mfg. Co., Div. of New Plastics Corp.** 398
1026 N. Sycamore Ave. Los Angeles 38, Calif.

Industrial hammers, mallets, drive punches, adapters (for rivet guns).

**O. K. Tool Co., The, Inc.** 633
Milford, N. H.

Toolholders and single point tool bits, inserted type milling cutters, multiple operation milling cutters, T-clot bolts, solid cutters and end mills.

**Oakite Products, Inc.** 1325
19 Rector St. New York 6, N. Y.

Rust removal compounds; soluble oil for machining, grinding, cutting; special drawing compound and drawing and forming composition; alkaline solvent, acidic detergents.

**Oil-Dyne Inc.** 1619
2115 W. Marquette Rd. Chicago 36, Ill.

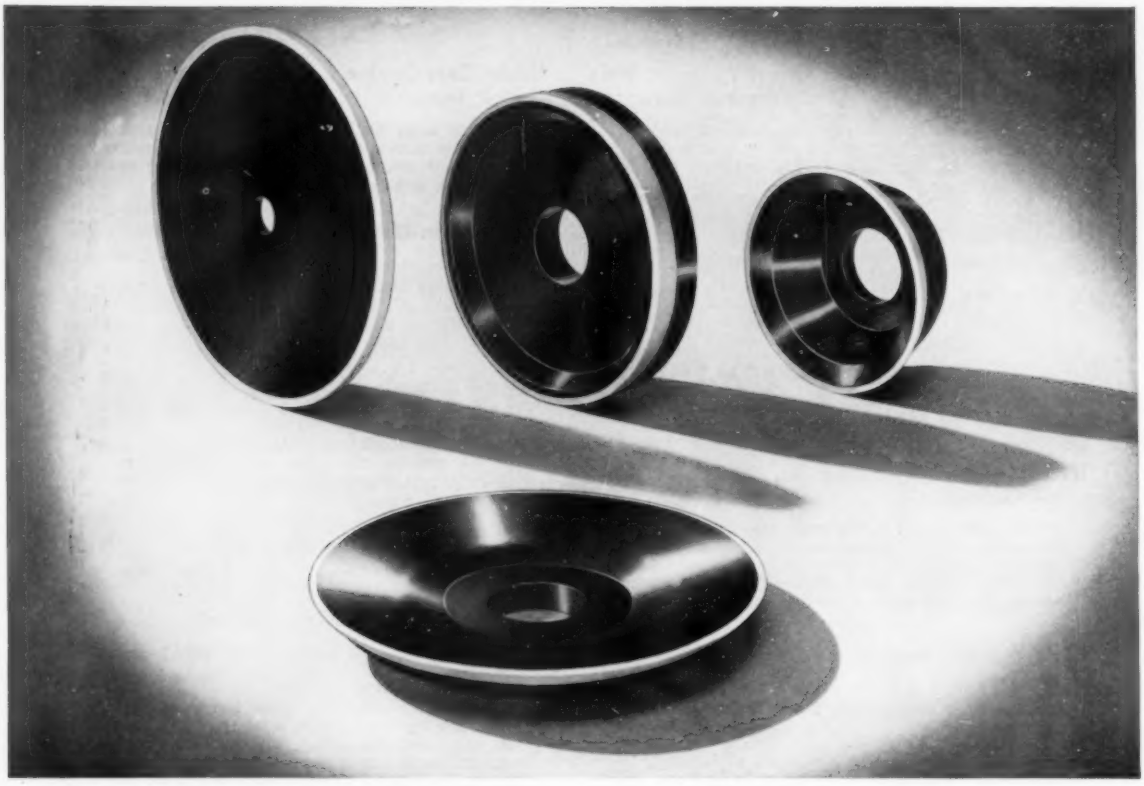
Miniature hydraulic components.

**Olsen, Tinius, Testing Machine Co.** 566
Easton Rd. Willow Grove, Pa.

Balancer, air-operated Brinell machine; automatic testing machine with automatic printing.

**O'Neil-Irwin Mfg. Co.** 1000
279 8th Ave. Lake City, Minn.

Benders, rod parters, shears, spring winders, press brakes, brakes, punch presses, notchers, rollers.



# MANHATTAN Diamond Wheels
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No other diamond wheels offer as high a degree of cutting efficiency for surface, cylindrical or internal grinding operations. That's because every Manhattan Diamond Wheel is specially *bonded* to assure precision grinding at top speed without loading or glazing . . . designed in the *exact* size and shape for your particular job requirements. Resinoid bonded Manhattan Diamond Wheels for tungsten carbide grinding permit cool, free cutting with light pressure . . . eliminate the danger of damage to heat-sensitive carbide, carbide tips and inserts. Special metal bonds give you the finish you want in grinding glass, quartz and ceramics. And because they will not load or glaze, Manhattan Diamond Wheels require no dressing . . . for either wet or dry grinding operations.

Specify faster, cooler cutting Manhattan Diamond Wheels from Manhattan's wide variety of surface-contact shapes . . . in the diamond concentration and grit size best suited for your grinding operations. You'll get higher wheel efficiency and longer life . . . "More Use per Dollar" . . . on the toughest job. Write to DIAMOND WHEEL DEPARTMENT.

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Booth No.

**Optical Gaging Products, Inc.** 917
26 Forbes St. Rochester 11, N. Y.

Contour projectors, custom staging fixtures and chart-gages for optical compartors, reticle tracer methods, chart and fixture materials and accessories, accessories and chart-gages.

**Orban, Kurt, Co., Inc.** 305
34 Exchange Pl. Jersey City 2, N. J.

Jig borer, keyway and slot automatic milling machine, vertical balancing machine, vertical turret lathe, horizontal milling and boring machine, boring and milling machine.

**Ortman-Miller Machine Co., Inc.** 314
19 143rd St. Hammond, Ind.

Air and hydraulic cylinders, boosters; tandem, duplex and adjustable stroke, air-hydraulic cylinders.

**Osborn Mfg. Co., The** 466
5401 Hamilton Ave. Cleveland 14, Ohio

Power brushes, brushing machines, brush application service.

**Ozalid Div. of General Aniline & Film Corp.** 1040
Ansco Rd. Johnson City, N. Y.

Whiteprint machines and sensitized papers, cloths, films for positive duplicating, positive paper and aluminum offset plates.

**Pangborn Corp.** 749
Hagerstown, Md.

Blast cleaning barrel, wet blast machine, air-blast cabinet, cloth-filter dust collector (in operation).

**Patterson, Geo. C., Machine Co.** 1812
3409 Trumbull St. Cleveland 15, Ohio

Wire straightening and cutoff machines, wire reels.

**Pease C. F., Co., The** 118
2601 W. Irving Park Rd. Chicago 18, Ill.

Reproduction equipment.

**Pedrick Tool and Machine Co., Inc.** 356
3640 N. Lawrence St. Philadelphia 40, Pa.

Double head bender, bending machine with fixture for offset bends and fabricated parts.

**Penton Publishing Co.** 151
1213 W. Third St. Cleveland 13, Ohio

Publications: *Steel, Foundry, Machine Design, Automation, New Equipment Digest and technical books.*

**Perfex Gage & Tool Co.** 1818
123 Avery St. Mt. Clemens, Mich.

Wheel dresser, internal grinding attachment.

**Perry Equipment & Engineering Co.** 1210
3125 Brandes St. Erie, Pa.

Vibratory parts feeders.

**Petz-Emery Co.** 910
Main St. Pleasant Valley, N. Y.

Dial indicators and dial indicator checkers.

Booth No.

**Pfauter Machine Co.** 336
3206 Fairfield Ave. Riverdale 63, N. Y.

Gear hobbing machine, spline shaft hobbing machine.

**Pines Engineering Co., Inc.** 197
601 Walnut St. Aurora, Ill.

Tube bending press, reinforcing bar bender, tool design for various bending operations, color movie.

**Pioneer Pump Div., Detroit Harvester Co.** 1406
5450 W. Jefferson Ave. Detroit 9, Mich.

Centrifugal type coolant pumps, machine tool coolant tank units, industrial and lubricant pumps.

**Pioneer Tool Engineering, Inc.** 1235
1601 E. El Segundo Blvd. El Segundo, Calif.

Cast aluminum tool and jig plates, zinc alloy tool and jig plates, fabricated jigs and fixtures, vacuum chucks, vacuum pumps.

**Portage Double-Quick Tool Co.** 669
1033 Sweitzer Ave. Akron 11, Ohio

Quick change tools, carbide cutoff tools, micrometer adjustable boring cartridges, internal hole comparator, groove checking gage.

**Porter Precision Products** 216
P. O. Box 208 Cincinnati 15, Ohio

Punches, die buttons, intermeshing sleeve type punches, perforators.

**Portomag, Inc.** 288
1511 E. Nine Mile Rd. Ferndale 20, Mich.

Magnetic drill press, magnetic plate clamp, voltage booster.

**Precise Products Corp.** 296
1328-30 Clark St. Racine, Wis.

Power quills (in operation), high-speed rotary tools, portable hardness testers.

**Precision Detroit Co.** 1230
20100 Sherwood Ave. Detroit 34, Mich.

Automatic assembly equipment and index tables.

**Precision Diamond Tool Co.** 318
Box 274 Elgin, Ill.

Diamond boring turning tools, dressers, wheels, powder; industrial diamonds, diamond files, mandrels, wheels for glass, lens; mist coolant.

**Precision Grinding Wheel Co., Inc.** 267
8301 Torresdale Ave. Philadelphia 36, Pa.

Disks, saucers, cutoff wheels, grinding wheels, segments, mounted points.

**Precision Tool & Mfg. Co. of Ill.** 806
1305 S. Laramie Ave. Cicero 50, Ill.

Offset boring heads, boring bars, V-blocks, parallel clamps.

**Precision Welder & Flexopress Corp.** 725
3520 Ibsen Ave. Cincinnati 9, Ohio

Automatic high-speed press, gear-driven circular seam welder, press type spot welder.

Booth No.

**Procunier Safety Chuck Co.** 1701
18 S. Clinton St. Chicago 6, Ill.

High-speed sensitive tapping attachments, tap holders, safety friction chucks, quick change chucks and collets, tapping macines and accessories.

**Production Devices Inc.** 795
North William St. Whitehall, N. Y.

Air vises (all types).

**Production Equipment Magazine** 714
407 S. Dearborn Chicago 5, Ill.

Publication: *Production Equipment Magazine.*

**Production Machine Co.** 625
311 Wells St. Greenfield, Mass.

Abrasive belt, centerless grinding machine; abrasive belt centerless polishing and finishing machine, twin belt surfacing machine.

**Producto Machine Co., The** 396
990 Housatonic Ave. Bridgeport 1, Conn.

Die sets, diemakers' accessories, hand tapping machine, ring punches and dies, vises, stock feeds, punch press, pressroom equipment, foot presses, die shearing in press, guidepin lubricators.

**Punch Products Corp.** 191
3800 Highland Ave. Niagara Falls, N. Y.

Perforating units, units for producing standard, semi-standard and developed notches, mounting and gaging accessories.

**Putnam Tool Co.** 105
2981 Charlevoix Ave. Detroit 7, Mich.

End mills and holders, pilot counterbores, chucking reamers.

**R and L Tools** 741
1825 Bristol St. Philadelphia 40, Pa.

Screw machine and turret lathe tools; screw machine (in operation).

**Racine Hydraulics & Machinery, Inc.** 229
2000 Albert St. Racine, Wis.

Variable volume pumps, pumps for fire resistant fluids, combination high-low pressure pumps, oil reservoirs and power units, manual, electric, mechanical and hydraulically operated valves, pressure and flow control valves, check valves, pressure boosters, fluid motors.

**Rahn Granite Surface Plate Co.** 928
641 N. Western Ave. Dayton 7, Ohio

Granite surface plates, angle plates, parallels, straight edges; surface plate calibration instrument.

**Raybestos-Manhattan, Inc.** 161
61 Willett St. Passaic, N. J.

Diamond wheels.

**Ready Tool Co., The** 1713
550 Iranistan Ave. Bridgeport 5, Conn.

Machine tool accessories.

Booth No.

**Reliant Gage & Supply Co.** 1010
4947 Firestone Blvd. South Gate, Calif.

Fixed gages, gage blocks, master setting rings, electric comparators, gage blocks, optical flats, light wave equipment, tooling balls, surface plates, bench centers, height gages, vernier calipers, indicator type gages.

**Rezolin, Inc.** 388
5736 W. 96th St. Los Angeles 45, Calif.

Plastic tools, jigs, fixtures and models.

**Rice Pump & Machine Co.** 264
Park St. Belgium, Wis.

Die filers and profile grinders.

**Richard Bros. Punch, Div. of Allied Products Corp.** 478
26500 Capitol Ave. Detroit 39, Mich.

Interchangeable punches and dies and retainers, punch and die retainers power press tooled.

**Richards, J. A., Co.** 721
903 N. Pitcher St. Kalamazoo, Mich.

Multiform benders, equipment for making steel rule metal blanking dies.

**Rivett Lathe & Grinder, Inc.** 324
18 Riverview Rd. Brighton 35, Boston, Mass.

Air cylinders and valves, air regulator and filter units, hydraulic cylinders and valves, hydraulic pump units.

**Robbins, Omer E., Co.** 416
24800 Plymouth Rd. Detroit 39, Mich.

Magnetic sine plates for grinding; nonmagnetic sine plates for inspection; nonmagnetic sine plates for machining.

**Robinson Aviation Inc.** 117
Teterboro, N. J.

Vibration and shock mounts for industrial machinery and machine tools.

**Rockwell Mfg. Co., Delta Power Tool Div.** 1410
400 N. Lexington Ave. Pittsburgh 8, Pa.

Lathe, band saw, belt grinder, surface grinders, tool grinders, drill presses (machines in operation).

**Rodgers Hydraulic Inc.** 126
7401 Walker St. Minneapolis 16, Minn.

Semimetal forming press, semiplastic molding press.

**Ross Operating Valve Co.**
120 E. Golden Gate Ave. Detroit 3, Mich.

Operating valves: 3-way and 4-way hand, foot, cam, solenoid and remote operated for control of air, vacuum and low pressure hydraulics.

**Roto-Mation, Inc., Subsidiary: Pines Eng. Co., Inc.** 724
945 E. Sater St. Greenville, Ohio

Air and hydraulic motor, special accessories for applications.

Booth No.

**Rotor Tool Co., The** 674
26300 Lakeland Blvd. Cleveland 32, Ohio

Portable pneumatic tools: grinders, wrenches, scalers, chippers, rammers, buffers, sanders, screwdrivers, nutsetters, drills, special tools.

**Rouse, H. B., & Co.** 1206
2214 N. Wayne Ave. Chicago 14, Ill.

Hand and air-operated millers, fixtures and fixture setups.

**Rowe Machinery & Mfg. Co., Inc.** 921
1506 N. Industrial Blvd. Dallas 7, Tex.

Automatic straightening and feeding machine, automatic coil cradles, automatic roll feed, magnetic sheet fanners.

**Royal Master Inc.** 810
Riverdale, N. J.

Centerless grinder.

**Royal Oak Tool & Machine Co.** 278
29800 Stephenson Hwy. Royal Oak, Mich.

Form relief grinders and fixtures.

**Rudd-Melikian Distributors of Illinois** 711
2456 S. Michigan Ave. Chicago, Ill.

Coffee vending machines (in operation).

**Russell, Holbrook & Henderson, Inc.** 353
292 Madison Ave. New York 17, N. Y.

Automatic lathes, automatic screw machines, gear hobbing machines, gear shaping machines, gear milling machines.

**Ryerson, Joseph T. & Son, Inc.** 1400
2558 W. 16th Chicago 8, Ill.

Mechanized flame-cutting demonstration employing electronic eye tracer; steel plate for tooling.

**S-P Mfg. Corp., The** 257
12415 Euclid Ave. Cleveland 6, Ohio

Power chucks, rotating air and hydraulic cylinders, high and low pressure air and hydraulic cylinders, valves, accessories.

**Sales Service Machine Tool Co.** 393
2363 University Ave. St. Paul 14, Minn.

High speed presses, air clutch press (in operation), power hack saw, die filer.

**Salvo Tool & Engineering Co.** 1814
26441 Gratiot Ave. Roseville, Mich.

Thread rolling attachments, sample rolled parts, hydraulic unit for turret lathe.

**Scharmann Machine Corp.** 1501
337 Boulevard of the Allies Pittsburgh 22, Pa.

Precision horizontal boring and milling machine, optical measuring equipment, automatic tool ejector, creep feed, automatic positioning and automatic facing head.

Booth No.

**Schauer Mfg. Corp.** 152
4500 Alpine Ave. Cincinnati 36, Ohio

Speed lathes, bench grinders, polishing machines, transformers, buffing machines.

**Schmarje Tool Co.** 1815
109 Pine St. Muscatine, Iowa

Carbide end mills; demonstration milling with carbide end mills with index machine.

**Schmidt, Geo. T., Inc.** 1311
4100 Ravenswood Ave. Chicago 13, Ill.

Hydraulic and pnuematic marking machines, with automatic feeds, accessories, numbering heads and hand marking tools, nameplate detail press (all machines in operation).

**Schrader's, A., Son, Div. Scovill Mfg. Co., Inc.** 525
470 Vanderbilt Ave. Brooklyn 38, N. Y.

Pneumatic press and machine controls; air cylinders, control valves, blow guns, quick acting couplers; air line lubricators, filters, regulators, etc.

**Schramm, Inc.** 600
West Chester, Pa.

Air compressors.

**Scott Paper Co.** 228
Front & Market Sts. Chester, Pa.

Tissue towels, service roll, paper wipers.

**Scully-Jones & Co.** 488
1901 S. Rockwell St. Chicago 8, Ill.

Precision holding tools, arbors and adapters, recessing tools, holders, chucks, mandrels and arbors, tool boards and presetting tools, tap drivers, nut runners, pin type arbors and mandrels, gages taper.

**Segal, Edward** 1813
72 Spring St. New York 12, N. Y.

Eyelet attaching machines, eyelets.

**Seibert & Sons, Inc.** 1500
Chenoa, Ill.

Multiple drill spindles, upper and lower drive assemblies for mutiple spindle drilling machines, tool drivers and holders.

**Selas Corp. of America** 1218
Philadelphia 34, Pa.

High-speed, pusher type furnace, machine brazing and soldering, automatic hardening and annealing, and selective flame hardening.

**Sentry Co., The** 284
62 Main St. Foxboro, Mass.

Electric steel hardening furnace (in operation).

**Service Diamond Tool Co.** 501
2505 Burdette Ave. Ferndale 20, Mich.

Diamond hardness testing machines and accessories.

**Service Machine Co.** 1506
2310 W. 78th St. Chicago 20, Ill.

Punch presses.

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SOMETHING REVOLUTIONARY IN THE FIELD OF FASTENERS WILL BE ON DISPLAY in Bristol's Booth No. 541 at the American Society of Tool Engineers Show* in Chicago, March 19-23rd. If you use socket screws you can't afford to miss the first showing of this brand new development. Bristol's Socket Screw Products, the most complete line on the market, are sold through leading Industrial Distributors. The Bristol Company, Bristol Road, Waterbury 20, Conn.

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Booth No.

**Severance Tool Industries, Inc.** 289
908 Iowa Rd. Saginaw 1, Mich.

Carbide hand files, mills, chatterless countersinks, seating tools, electrode dressers, burs, grinding demonstration, etc.

**Sheldon Machine Co., Inc.** 1240
4258 N. Knox Ave. Chicago 41, Ill.

Variable speed drive lathe; geared head lathe; pedestal mounted lathe.

**Shell Oil Co.** 1306
50 W. 50th St. New York 20, N. Y.

Rust preventives.

**Sheppard, Stanley** 415
30 Church St. New York 7, N. Y.

Hydraulic copying lathes, geared head lathes, milling machines, radial drill.

**Siewek Tool Co.** 1425
2862 E. Grand Blvd. Detroit 2, Mich.

Jig and fixture components, aircraft automatic clamping device, locks, clamps.

**Simonds Abrasive Co.** 1120
Tacony & Fraley Sts. Philadelphia 37, Pa.

Bonded abrasive products and abrasive grain.

**Simonds Saw & Steel Co.** 1120
Fitchburg, Mass.

Metal cutting circular saws, band saws and hack saws; files; flat ground die steel; rotary and squaring shears; special alloy and magnet steels.

**Simplex Machine Tool Corp.** 1612
4548 W. Mitchell St. Milwaukee 46, Wis.

Precision boring machines.

**Sintox Corp. of America** 1436
270 E. Hamilton St. Allentown, Pa.

Cutting tools, cutting toolholders, special products.

**Size Control Co., Div. of American Gage & Machine Co.** 930
2500 W. Washington Blvd Chicago 12, Ill.

Precision inspection gages, centerless lappers, tube socket tester, gage laboratory.

**Skinner Chuck Co., The** 263
95 Edgewood Ave. New Britain, Conn.

Hand operated chucks and vises, power chucks and chucking equipment, solenoid valves, work drivers.

**Socony Mobil Oil Co., Inc.** 279
26 Broadway New York 4, N. Y.

Industrial lubricants, etc.

**Spati Industries, Inc.** 1613
410 Main St., P. O. Box 501 Covington, Ky.

Radial relief grinding attachments, wheel truing collars.

Booth No.

**Spiral Step Tool Co.** 109
5400 N. Damen Ave. Chicago 25, Ill.

Special cutting tools, carbide and high-speed.

**Spitfire Tool Co.** 736
2931 N. Pulaski Rd. Chicago 41, Ill.

Automatic and mechanical flat lapping machines, cylindrical lapping machine.

**Standard Electrical Tool Co.** 830
2490 River Rd. Cincinnati 4, Ohio

Spindles, slides, feeds and other machine tool attachments.

**Standard Gage Co., Inc.** 1016
70 Parker Ave. Poughkeepsie, N. Y.

Indicating gages, comparators, portable thickness gages, caliper gages, internal caliper gages, limit gages, luggages, ring gages, master disks, Woodruff keyway gages, disks, limit pin, length and plug gages.

**Standard Parts Co.** 1407
1000 Broadway Bedford, Ohio

Component parts of jigs and fixtures. T-slot bolts, interchangeable precision parts.

**Standard Pressed Steel Co.** 479
Jenkintown, Pa.

Socket screw products, locknuts, spring pins, storage walls, alloy steel and titanium aircraft fasteners.

**Star Cutter Co.** 1329
34500 Grand River Ave. Farmington, Mich.

Form hobs, carbide reamers and milling cutters.

**Starlite Industries Inc.** 300
58th & Market Sts. Philadelphia 39, Pa.

Industrial diamonds: core drills, wheel, mounted points, cutoff wheels, files, dressers, etc.; spray system, rotary carbide tools: burrs, files, end mills, drills, slitting saws, air grinder.

**Starrett, L. S., Co., The** 1116
Crescent St. Athol, Mass.

Mechanic's hand measuring tools and precision instruments, dial indicators, steel tapes, hacksaws, hole saws, band saws, band knives and precision ground die and flat stock.

**Steel Products Engineering Div. Kelsey Hayes Wheel Co.** 660
1205 W. Columbia St. Springfield, Ohio

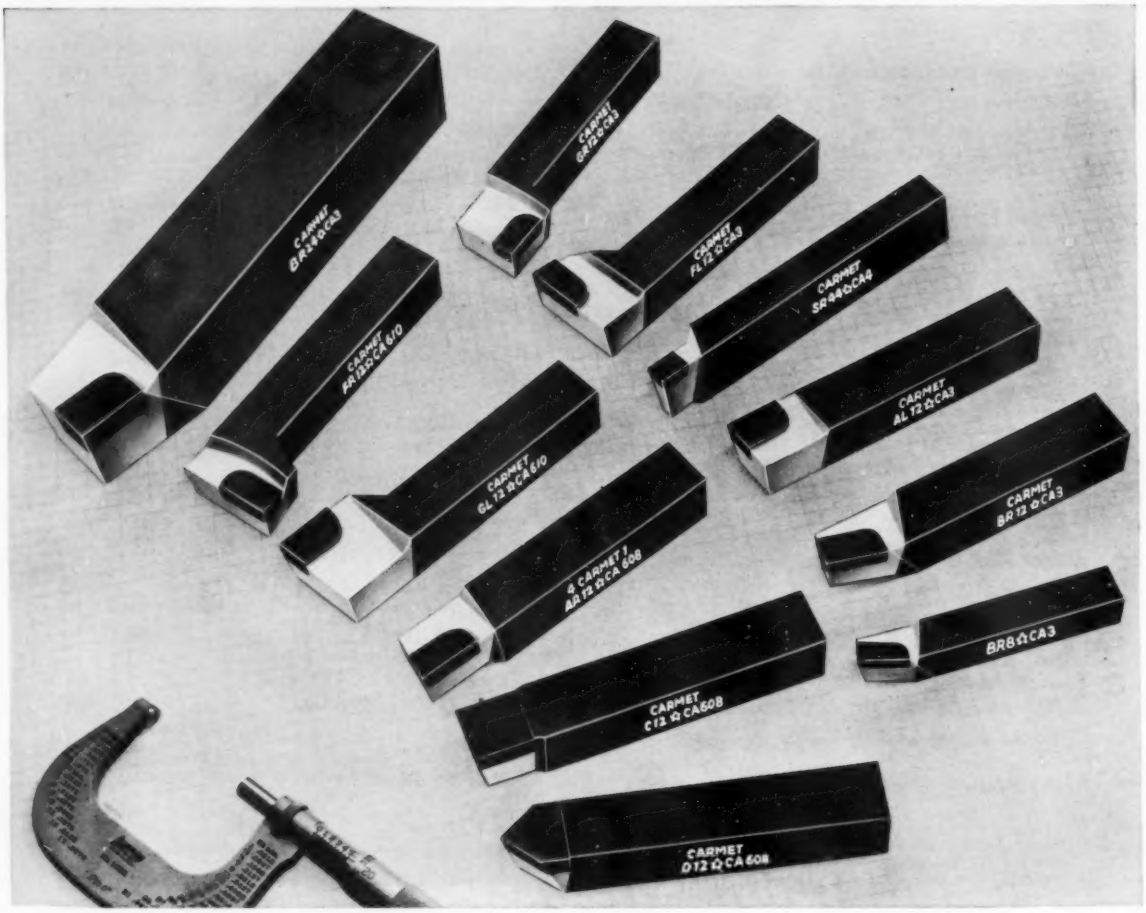
Automatic tube cutting machine, shimmy trimming dies.

**Stone Machinery Co., Inc.** 755
316 Fayette St. Manlius, N. Y.

Nonferrous metal sawing machine, swivel head machine, standard traverse cutting unit, cutoff machine.

**Stupakoff Div. of The Carborundum Co.** 1309
Hillview Ave. Latrobe, Pa.

Oxide cutting tools, oxide gage blanks, demonstration of cutting with oxide tools.

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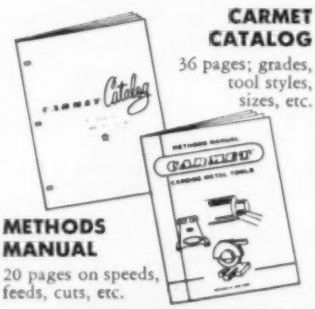


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The Allegheny Ludlum line of Carmet Carbide Tools is *complete*—every style, size and grade you may need for any cutting job in the shop. If you make your own tools, a full line of blanks is available, too—as well as all necessary grades of AL Tool Steels for back-up materials. Extensive stocks of Carmet standard tools and blanks are carried in Distributors' warehouses coast to coast, and special tools are available to order. • Just remember, for best performance on any application, *use Carmet! Allegheny Ludlum Steel Corporation, Carmet Division, Wanda and Jarvis Aves., Detroit 20, Michigan.*

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AL® FINE TOOL STEELS SINCE 1854

Booth No.

**Sunnen Products Co.** 474
7910 Manchester Ave. St. Louis 17, Mo.

Honing machines: equipment, tooling and accessories.

**Super Tool Co.** 122
21650 Hoover Rd. Detroit 13, Mich.

Masonry drills; carbide tipped milling cutters, drills, lathe centers, end mills, center bores, single point tools, boring tools; solid carbide end drills, reamers.

**Superior Hone Corp.** 551
1605 Elreno St. Elkhart, Ind.

Honing machines and equipment; drill press attachments.

**Superior Pneumatic & Mfg. Inc.** 1224
4758 Warner Rd. Cleveland 25, Ohio

Air hammers, air filters, air couplers, air drills, air regulators, blow guns.

**Superior Steel Products Corp.** 338
2754 S. 19th St. Milwaukee 15, Wis.

Die sets, pins, bushing and removable cap pin die sets.

**Supreme Products, Inc.** 138
2222 S. Calumet Ave. Chicago 16, Ill.

Geared drill chucks, chuck keys and arbors, reversible speed reducer, tapping attachment.

**Swanson Tool & Machine Products, Inc.** 404
814 E. 8th St. Erie, Pa.

Straight line index unit, turret index machine chassis, heavy duty turret index machine chassis, special machinery, index drive unit.

**Swivelier Co., Inc.** 503
43-34th St. Brooklyn 32, N. Y.

Incandescent and fluorescent lighting units for industrial and commercial applications.

**Sykes Tool Corp., Ltd.** 342
123-131 York St. Toronto, Ont., Canada

Vertical rack and gear generating machines, gear tooth comparator, rolling gear tester, cutters, hobs and master gears.

**Syntron Co.** 631
Homer City, Pa.

Vibrating and gravity parts feeders, vibrating lapping-polishing machines, electric bin vibrators, conveyors, vibrating spiral elevators, mechanical shaft seals, selenium rectifiers, vibratory packers, hopper level switches, flow control valves, portable electric hammers and saws.

**Taylor Devices, Inc.** 292
188 Main St. North Tonawanda, N. Y.

Liquid springs, combination spring and shock absorber.

**Taylor Dynamometer & Machine Co.** 779
6411 River Pky. Milwaukee 13, Wis.

Sensitive precision drilling machines, dividing head, speed-button balancing machine (all in operation).

Booth No.

**Texas Co., The** 1236
135 E. 42nd St. New York 17, N. Y.

Metalworking lubricants and parts produced with their use.

**Thomas Publishing Co.** 826
461 Eighth Ave. New York 1, N. Y.

Publications: Thomas Register of American Manufacturers (Directory); Industrial Equipment News.

**Thompson, Earl A., Mfg. Co.** 1444
1300 Hilton Rd. Ferndale 20, Mich.

Cam powered, self-contained hydraulic unit (in operation).

**Thread-All Sales Co.** 740
1045 Perry St. Detroit, Mich.

Tapping machines, portable hand tappers, floating toolholders.

**Tinius Olsen Testing Machine Co.** 566
Easton Rd. Willow Grove, Pa.

(See Olsen, Tinius, Testing Machine Co.)

**Tocco Div., The Ohio Crankshaft Co.** 440
3800 Harvard Ave. Cleveland 5, Ohio

Induction heating equipment, ultrasonic cleaning equipment.

**Tomco Products Co.** 1213
Racine, Wis.

Handwheels, machine handles, cranks, clamping levers, hand knobs, ball handles.

**Tomkins-Johnson Co., The** 225
617 N. Mechanic St. Jackson, Mich.

Riveters, clinchers, reamers, die sinking milling cutters, remote controls, air and hydraulic cylinders.

**Tool Engineer, The, American Society of Tool Engineers** 840
10700 Puritan Ave. Detroit 38, Mich.

Publication: THE TOOL ENGINEER.

**Torit Mfg. Co.** 193
292 Walnut St. St. Paul 1, Minn.

Industrial dust collectors.

**Torrington Co., The** 219
59 Field St. Torrington, Conn.

Rotary swaging machines.

**Tree Tool & Die Works** 605
1600 Junction Ave. Racine, Wis.

Vertical milling machines, universal milling attachments, taper boring tools, milling machine accessory equipment.

**True-Trace Sales Corp.** 760
9830 E. Rush St. El Monte, Calif.

Hydraulic tracer instruments and controls, manual screw feed (in operation), dimensional die sinker with manual screw feed (in operation).

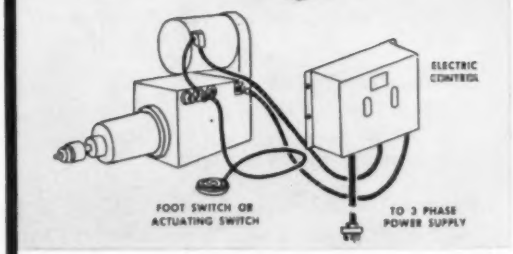
# NOW--TWO PRODUCTION TOOLS FOR THE COST OF ONE!

THE *New* DUMORE SERIES 28

## "DRILL-N-TAP" UNIT

Now you can get two machines for the cost of one — a driller and tapper — all in the same automatic Dumore unit. What's more, you can mount work close to the fixture with little tool travel and get faster cycling . . . less unproductive idling time!

The *reversing motor* on the Dumore Drill-N-Tap Unit reduces wear and eliminates expensive clutches. In most instances, you can tap with the same drill fixtures and set-up by simply removing drill bushing. Just flip the control switch for either tapping or drilling. Tap fits into chuck — no extra tapping head is required.




### *Check These Outstanding Cost Saving Features!*

- No clutches to wear and replace
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- Mounts practically anywhere — quickly
- Drills or taps at flip of a switch
- For long and short production runs
- Utilize same set-up for drilling and tapping
- Spindle speeds — 265 to 4900 R.P.M.
- Also mounts on standard drill press column for single spindle automatic driller and tapper

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**VISIT THE DUMORE BOOTH No. 678, ASTE TOOL SHOW March 19-23, International Amphitheater, Chicago**

**Unique nose mounting device for set-up in any position.**

**You Can Save Hundreds of Dollars in First Cost Alone, With Any of These DUMORE Automatic Drill Units**

**SERIES 24**

**Fully automatic with all controls built-in.**

Ideal for production runs with varying conditions and frequent change-overs . . . For single or multiple unit operations. Pre-selected speeds, feeds, depth. Simple nose mounting bracket permits set-up at any angle — saves tooling and fixture costs.

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Identical in size and capacity to Series 24, with just basic controls built-in for long, uninterrupted production runs.

**AUTOMATIC DRILL HEAD SERIES 20**

- For high production drilling of small parts
- Eliminates drill breakage
- Automatic built-in controls
- No. 80 to 5/32" drill capacity

**DRILL GRINDER SERIES 21**

For fast, accurate sharpening of small twist drills. Capacity: all 2-lip twist drills—No. 70 to ¼", including crankshaft drills. Grinds included angles from 90° to 150°, clearance angles from 5° to 15°.

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**PRECISION TOOLS**

**AUTOMATIC DRILL UNITS • TOOL POST AND HAND GRINDERS**

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Booth No.

**Tubular Micrometer Co.** 924
333 Armstrong Blvd. N. St. James, Minn.

Quality control measuring instruments: micrometers, verniers, rules, scales, gages, indicators and tool adaptations, photographs and samples of special applications.

**Tubular Rivet & Stud Co.** 670
Weston Ave. Wollaston 70, Mass.

Tubular and split rivets, automatic riveting machines, electrical contacts, special nuts, plug gages, production machine work.

**Turnomat Co., Inc.** 1131
Clinton St. Brockport, N. Y.

Lathes, accessories and attachments.

**Twentieth Century Mfg. Co.** 241
Rte. #176 & Bradley Rd. Libertyville, Ill.

Reamers, counterbores, solid pilot, special cutting tools, die stops, accessories, portable inspection lights.

**U. S. Tool Co., Inc.** 375
255 N. 18th St. Ampere (East Orange), N. J.

Slide feed with straightener, coil cradles, single roll feed, combination coil cradle and power driven straightener, slide feed.

**Uddeholm Co. of America, Inc.** 234
155 E. 44th St. New York 17, N. Y.

Tool and die steels, drill rods, flat ground tool steel, tool bits, cold rolled strip steel specialties and carbide tipped rock drills.

**Union Mfg. Co.** 808
296 Church St. New Britain, Conn.

Die sets, chucks, guideposts, bushings, springs, top jaws.

**United States Rubber Co., Mechanical Goods Div.** 792
Rockefeller Center New York 20, N. Y.

Belt drives, protective boots.

**Universal Cyclops Steel Corp., Cyclops Div.** 552
Titusville, Pa.

Colored transparencies of 2000-ton press and vacuum melting unit.

**Univertical Foundry & Machine Co.** 202
14841 Meyers Rd. Detroit 27, Mich.

Safety shop hammer.

**V & O Press Co. Div., The, The Emhart Mfg. Co.** 509
Hudson, N. Y.

Notching press with feeder, automatic feed unit, small straight side press.

**Vacu-Blast Co., Inc.** 1819
Bragato Rd. Belmont, Calif.

Blasting machine for dry blast honing of precision parts.

Booth No.

**Valenite Metals** 1124
Box 205 Royal Oak, Mich.

Carbide insert tooling, carbide throwaway inserts.

**Valvair Corp.** 130
454 Morgan Ave. Akron 11, Ohio

Solenoid control valves, manual and mechanical control valves.

**Vanadium-Alloys Steel Co.** 1511
Latrobe, Pa.

Free machining steels, cold drawn special shape steels, stainless steel powder, vacuum-melted tool steels, tool bits, drill rod, metal powders, die and tool steels, flat ground stock.

**Van Keuren Co., The** 1037
176 Waltham St. Watertown 72, Mass.

Plain plug gages: reversible wire type, taper lock, and trilock in steel, chromium plate, carbide; thread and gear measuring wires; gage blocks; optical flats; monochromatic lights; light wave micrometers; special parts; precision lapping.

**Vapor Blast Mfg. Co.** 218
3025 W. Atkinson Ave. Milwaukee 16, Wis.

Toolroom liquid honing machines.

**Vascoloy-Ramet Corp.** 1137
800 Market St. Waukegan, Ill.

Toolholders for throwaway inserts, carbide face mill, ceramic throwaway inserts, carbide products, carbide cutting tools, carbide dies.

**Vickers Inc.** 1411
1400 Oakman Blvd. Detroit 32, Mich.

Oil hydraulic pumps, motors, valves and accessories, power units, hydraulic flow diagrams, display units, cutaways.

**Victor Adding Machine Co.** 679
3900 N. Rockwell St. Chicago 18, Ill.

Tool crib control, gage and gage inspection control, blueprint control, cutter grinding control, tool order scheduling and control, tool stores control, production control, machine loading, scheduling and job assignment, factory forms, maintenance control.

**Vlier Engineering, Inc.** 1113
8900 Santa Monica Blvd. Los Angeles 46, Calif.

Torque thumbscrews, spring plungers, spring stops, fixture keys, toggle pads, swivel pad clamps and knurled head swivel pad clamps.

**Vulcan Tool Co., The** 515
730 Lorain Ave. Dayton 10, Ohio

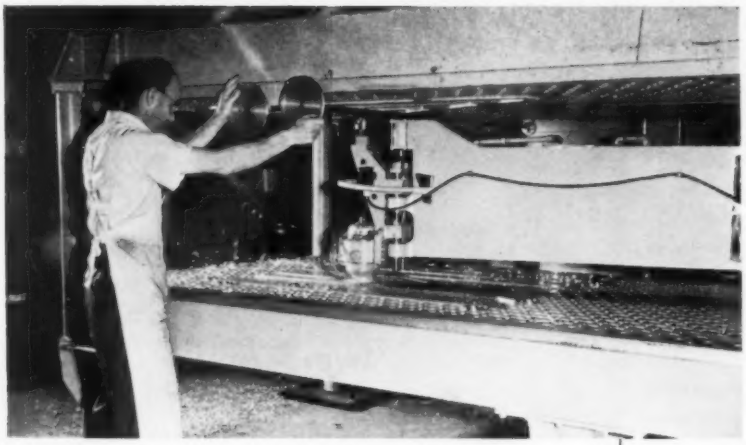
Tools, dies, special machines, jig grinder, rotary table.

**Wadell Equipment Co.** 135
119 South Avenue Garwood, N. J.

Vertical precision boring machines, vertical precision turning machine, automatic indexing table, precision boring spindles, diaphragm chucks.

One of a series
MODERN TOOLING TECHNIQUES

# 100% STABILITY FOUND IN NEW VACUUM CHUCK



Octopus Grip Vacuum Chuck, developed by Convair – a Division of General Dynamics Corporation, San Diego – is shown here on a skin milling machine. Upper chuck holds pattern, lower chuck holds material. Approximately 1000 suction cups can be used to hold skin during milling operation.

Pioneer Tool Engineering, Inc., 1601 E. El Segundo Blvd., El Segundo, California is the licensed manufacturer of the Octopus Grip Vacuum Chuck.

*Write for 921-T Catalog*

**shows complete range of applications, important mechanical properties, stock sizes and special cast sizes.**

The suction cups use removable rubber grommets. A screw in the center hole serves as a shut-off valve. This allows any shape skin to be placed on chuck without complicated sealing-off of vacuum source typical of some vacuum-type chucks.

PIONEER

*Formula* 921-T

cast aluminum tooling plates and bars
for use in jigs, dies, fixtures and special machines.

**Like all vacuum chucks,** specifications for the new Octopus Grip Vacuum Chuck required a high degree of stability due to the close tolerance present in milling operations.

Engineers specified Pioneer 921-T, a specially alloyed cast aluminum tooling material.

921-T is 100% stable under all temperature conditions, lightweight, rigid, and easy to machine.

One of the leading qualifications for Pioneer 921-T's use in vacuum chucks is that it will expand and contract at the same rate of the material being milled. In addition, chucks made from 921-T are extremely lightweight and so rigid that chucks often are merely clamped down rather than bolted.

Of course, where many grooves are concerned, 921-T is ideal. It's easily machined.

Pioneer 921-T is probably the top material available for vacuum chucks.

**WHERE TO BUY 921-T:**

**PIONEER TOOL ENGINEERING, INC.**
*1601 E. El Segundo Blvd., El Segundo, Calif.*

**PIONEER SALES ENGINEERING**
Inkster, Michigan

**MEIER BRASS & ALUMINUM CO.**
Hazel Park, Michigan

**EDGCOMB STEEL & ALUMINUM**
Hillside, New Jersey

**INDUSTRIAL METALS**
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See Pioneer Vacuum Chuck set up in Booth #1235, ASTE Industrial Exposition Chicago, Illinois, March 19-23.

Booth No.

**Waldes Kohinoor, Inc.** 251
47-16 Austel Place — Long Island City 1, N. Y.

Retaining rings, pliers, dispensers, applicators and accessory and application tools, grooving tool and accessories, application assemblies.

**Wales-Strippit Corp.** 379
345 Payne Ave. — North Tonawanda, N. Y.

Punching and notching equipment, fabricator (punch press), tube piercing units, positive duplicator (duplicator attachment for fabricator).

**Walker-Turner Div., Kearney & Trecker Corp.** 1525
900 North Ave. — Plainfield, N. J.

Hand and air feed drill presses, hand and air feed cutoff saws, metal-cutting band saws, abrasive cutoff saws.

**Ward-Riddle Co., The** 312
241 Myrtle St. — Ravenna, Ohio

Turret lathe drill speeders.

**Warner & Swasey Research Corp., The** 646
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Measuring instruments for gears, cams, turbine blades. Automatic gaging, assorting and measuring machines, high temperature measuring instruments, research and development service for controls, instruments and machinery.

**Watson Publications, Inc.** 1616
201 N. Wells St. — Chicago 6, Ill.

Publication: Modern Industrial Press.

**Webber Gage Co.** 936
12900 Triskett Rd. — Cleveland 11, Ohio

Gage blocks and accessories, temperature checks, height gage, interferometer.

**Weldon Tool Co., The** 629
3000 Woodhill Rd. — Cleveland 4, Ohio

End mills, holders and adapters, sharpening fixtures, counterbores, countersinks, deburring tools, lathe measuring attachment, pumps, screw machine cutting tools, carbide cutting tools, milling cutter clearance gage, T-slot cutters, corner rounding cutters, die sinking cutters.

**Wells Mfg. Corp.** 274
407 E. Jefferson — Three Rivers, Mich.

Horizontal metal cutting band saws, band saw machines. Automatic stock projection equipment.

**Wesson Co.** 450
1220 Woodward Hts. Blvd. — Ferndale 20, Mich.

Carbide inserts, blades, shapes and forms; carbide cutting tools, milling cutters, toolholders, etc.; universal vises, locks; carbide tool grinders.

**West Point Mfg. Co.** 290
26935 W. Seven Mile Rd. — Detroit 19, Mich.

Jig and fixture parts, toggle clamps, leaf jigs, T-bolts and bolster bolts.

Booth No.

**Westplex Corp.** 1207
12 Commercial St. — Rochester 14, N. Y.

Nylon gears.

**Wetmore Reamer Co.** 1816
418 N. 27th St. — Milwaukee 8, Wis.

Metal-cutting tools: inserted blade reamers, inserted blade end mills, boring bars, boring bar units, arbors, blades and tool bits.

**Wheelebrator Corp.** 146
400 S. Byrkit St. — Mishawaka, Ind.

Airless blast mill, wet blast machine, shot peening process.

**Whiton Machine Co.** 730
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Lathe chucks.

**Wickman Mfg. Co., The** 597
10325 Capital Ave. — Oak Park 37, Mich.

Diamond wheels, adjustable floating reamers, precision tapping attachments, carbide grinders, index automatic screw machines, tracing milling machine.

**Willey's Carbide Tool Co.** 653
1340 W. Vernor Hwy. — Detroit 1, Mich.

Carbide tipped tools, solid carbide tools, automation broaches and reamers, diamond wheel dressing tools, tableting low-melting alloy (in operation) preformed blanks, solid carbide drills.

**Wilton Tool Mfg. Co., Inc.** 1208
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Air-hydraulic bench and machine vises, machinists' bench vises, combination bench and pipe vises, C-clamps, wood-workers' vises, positioners.

**Wilson Mechanical Instrument Div., American Chain & Cable Co., Inc.** 909
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Automatic testers, Rockwell and other hardness testers, tester with gear testing fixture.

**Wisconsin Drill Head Co.** 502
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Multiple spindle adjustable drill and tapping heads, drill head component parts, lead screw tapping unit.

**Woodworth, N. A., Co.** 412
1300 E. Nine Mile Rd. — Detroit 20, Mich.

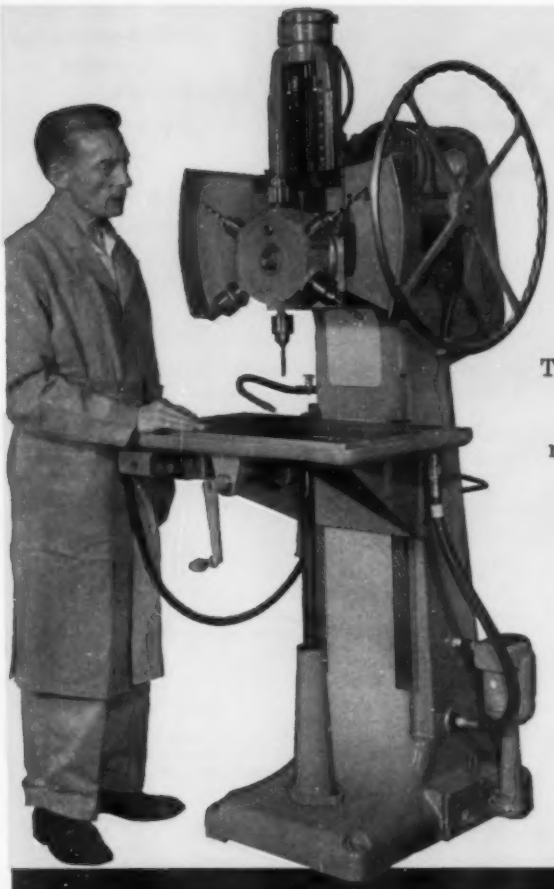
Collet arbors, diaphragm chucks and arbors, inspection fixtures, gear chucks, finger chucks, cone-lok jigs, adjustable thread ring gages, fixed gages, precision parts, investment castings.

**Zagar Tool, Inc.** 179
24000 Lakeland Blvd. — Cleveland 23, Ohio

Collet fixtures, multiple spindle gearless drill heads, drill fixtures, drilling machines, broaching machines and broaches.

**Zeiss, Carl** 1013
551 Fifth Ave. — New York 17, N. Y.

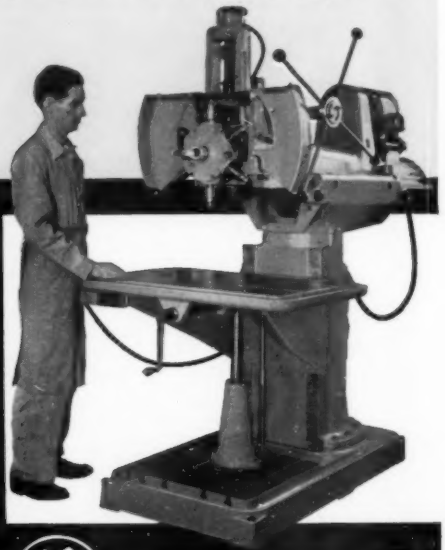
See Ercona Corp.



# NEW *a sensitive, fast* BURGMASTER®

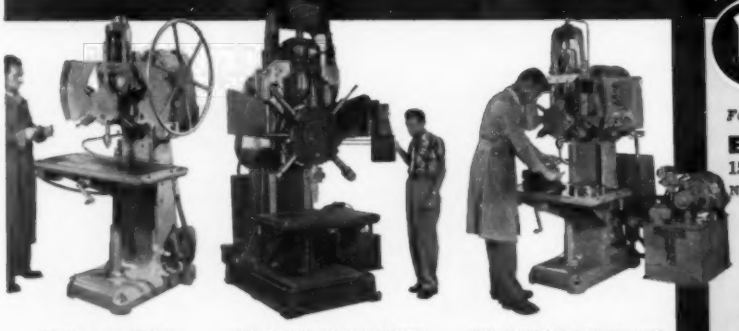
## TURRET DRILL—Model 1C

The Model 1C Turret Drill expands the BURGMASTER line to include a smaller capacity, sensitive feed, fast operating machine. It is built to the same rugged standard for rigidity and accuracy evident in the larger BURGMASTER units. Users will experience such important benefits as fast power indexing; very sensitive hand feed; preselective speeds and stops; time savings and increased accuracy by elimination of quick change tools, or need for moving from one machine to another; easy handling of holes up to ⅜" in steel, thus freeing heavy duty machines for larger capacity work.



### The *IMPROVED* Model 2BR RAM TYPE RADIAL TURRET DRILL...

features a new sensitivity in handling, power indexing and power clamping. When the ram is clamped in position, the 2BR can function as a deep throat production turret drill, easily handling holes up to ¾". This machine greatly increases production on bulky pieces as all tools are mounted on the machine and are quickly indexed into position. The operator simply brings the spindle into position over the work, releases pressure on a button in the handle (located on turret head) and the machine automatically clamps ram and column. He is ready quickly to drill, tap, etc., thereby saving repositioning several times over a particular position.



2B HAND OPERATED (¾" CAPACITY)

3BH AUTOMATIC HYDRAULIC (1½" CAPACITY)

2BH AUTOMATIC HYDRAULIC (¾" CAPACITY)

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*See BURGMASTERS in action—Booth 389 ASTE Industrial Exposition, March 19-23 CHICAGO International Amphitheatre.*

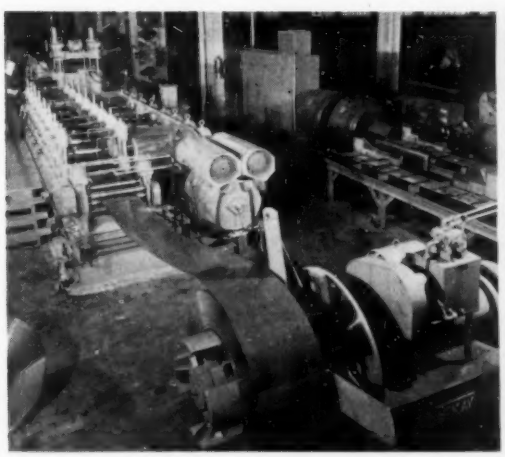
# PROGRESS IN PRODUCTION

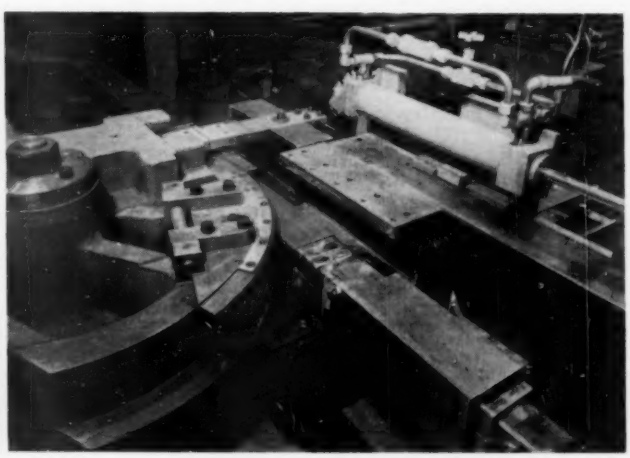
## INSTALLATION AFFORDS CONTINUOUS FRAME PRODUCTION

TWO OPERATIONS, one employing a tube mill which forms 100 ft of steel tube per minute and a special bending machine, have been introduced into mass production of frames at Chevrolet's Stamping and Frame Plant near Flint, Michigan. The tube mill eliminates handling, stamping and slow welding methods common in conventional production. Strip steel from coils unwinds at one end of the mill, traveling through a series of seven forming rolls. The initial rollers are arranged similar to washing machine wringers, but the slots through which the steel passes gradually form it into a crescent shape. By the time the steel passes the last roll it has been worked into a hollow tube, and is heated and fused along the seam by a rotary resistance welder.

Near the end of the mill, the tubing travels through a "Turk's-head" rolling operation which converts the tube circumference into a rectangular box girder. A flying saw slices the tubing into double lengths which are halved by a cutoff press to form the main section of a frame side member. The continuous process achieves greater rigidity in the frame and knocks off approximately 4½ pounds of weight added by overlap between the two channels resulting from the conventional method.

The key of the success in the operation is the bending machine which gives girders the contours required by the frame design. Without this, the tube mill process could not have been adopted. In the bending operation articulated mandrels are inserted in hollow girders under hydraulic pressure. The mandrels back up the sides of the unheated girders while the cold bending in take place. In the subsequent operations, five bends are put in the girder, with intricate mandrels containing as many as 70 jointed parts. Side members are similarly produced. Another innovation at the plant is the piercing of bolt holes in body brackets after attachment to the side members. An equalizing fixture is used to insure that bolt holes are in position, facilitating assembly operations and minimizing stresses. Materials handling has also been mechanized to a large degree in the plant.



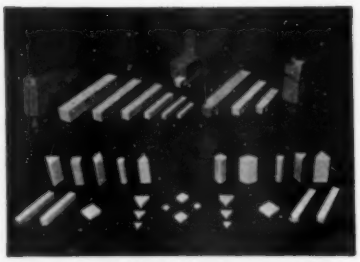


## MORE NEWS OF CERAMIC CUTTING TOOLS

Tool engineers and production engineers who have been following the numerous current developments in ceramic cutting tools will be interested in the announcement by Diamonite Products Div. of United States Ceramic Tile Co., Canton, Ohio of Diamonite tools. The firm has been engaged in production and fabrication of this type of material for approximately fifteen years. Work in the application of the material to cutting tools date back several years and include extensive experimental work, both in the company's laboratories and in production.

The material is a synthetic sapphire substance in bond, consisting essentially of a specially-prepared, high-purity aluminum oxide, combined with a small amount of mineralizing agents and fabricated at temperatures in excess of 3000 deg F. It possesses properties closely akin to those of the precious gem, sapphire. It has a fine-grain crystalline structure capable of being ground and polished to gem brilliance with diamond abrasives. This ability to take a high polish in combination with its extreme hardness and wear resistance is of particular advantage in promoting long tool life and high cutting efficiency, at ultrahigh surface speeds.

Physical characteristics give ceramic cutting tools many advantages in present day machine tool operations and may be expected to make even larger contributions as faster, more powerful and more rigid machines are developed



**Ceramic cutting tools of Diamonite include standard turning tools, blanks, inserts and lozenges. Special tool holders are designed to give rigidity.**

They can be used for machining metals, alloys, plastic and abrasive materials including ceramics and graphite products at high speeds. Because of extreme hardness and wear resistance and the fact that cutting edges withstand high temperatures without losing their properties, tool life is excellent and cratering practically negligible. The tools remain cool at highest cutting speeds and use of coolants is unnecessary although permissible.

Because of rigidity and the fact that they will not weld to metals, they produce a fine, smooth finish approaching the quality of a ground surface, cutting without chatter when properly supported. They can be used without danger of contamination of work materials such as dielectric and electrical insulating materials and eliminate chip removal difficulties when machining magnetic materials.

When properly applied, ceramic cutting tools outperform metallic tools in certain areas, working best at high surface speeds with conventional or somewhat lighter feeds. The rate of stock removal begins about the high limit of current high-production tools so power and rigidity of the machine is particularly important to enable the user to take fullest advantage of ceramic tools and assure successful use.

Research has been restricted by the limitations of available machines and it is felt that redesign of machines may be necessary to realize full potential of these tools. There are many operations, however, on which they will, doubtless, show important advantages even when older equipment is used. Best cutting speeds and feeds for all materials are not known.

Rigid over-all tool support is of utmost importance for most satisfactory service. Because of the extremely hard and inflexible nature of the material, toolholding devices should exert uniform pressure distributed over large areas of the tool rather than localized in a spot. Holders similar to those used for insert-type tools are recommended for rigidly supporting the tool and avoiding breakage.

Faster production and improved quality in the automatic arc welding of trailer frame seams will be achieved by this new fixture at PAMCO COMPANY, Frazer, Michigan, through the use of Lapeer Air Clamps.

Pictured above is the Pamco holding fixture which features a battery of 10 Lapeer AO-1200 Air Clamps in place of the time-consuming C-Clamps formerly used.

This is another example of Lapeer's know-how—its ability to help industry cut time and slash costs. If you have a work holding problem, Lapeer-designed clamps can help you do a better job—at lower cost. Write today for complete information.

See all of these at our BOOTH #553, A.S.T.E. SHOW at Chicago in March.

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## NEW USE OF ULTRASONICS

In the vanguard of tomorrow's tooling is the application of ultrasonics, sound waves inaudible to the human ear. The scope of its utility has scarcely been manifest, even in the laboratory. By a new technique, GE is experimentally treating materials used in electrical insulation, using ultrasonics. These tests show such methods may speed up the process of producing such materials as much as ten times.

George E. Henry of the GE Engineering Laboratory recently disclosed development of the ultrasonic impregnation technique in a recent address. He said semiporous materials such as paper and cloth are treated speedily for insulation purposes. The method required replacing air and water content of the material with an insulating liquid such as varnish, resin or asphalt.

Sound waves from an ultrasonic generator are beamed through the liquid. Material to be treated is dipped into the liquid in the path of the sound wave. The ultrasonic beam agitates the liquid with a motion that changes the direction of the particles of the liquid a million times a second. Further improvements are necessary to make the process economically practical in automatic production of insulation materials, he reported.

Improvements needed are in equipment rather than technique. The process can also be used in treating materials for other uses such as laminar plastics. As a tool, ultrasonics are being used more widely for cleaning minute or inaccessible parts, for bonding materials and for similar jobs. It is forecast as an increasingly significant factor in the growing trend toward automation.

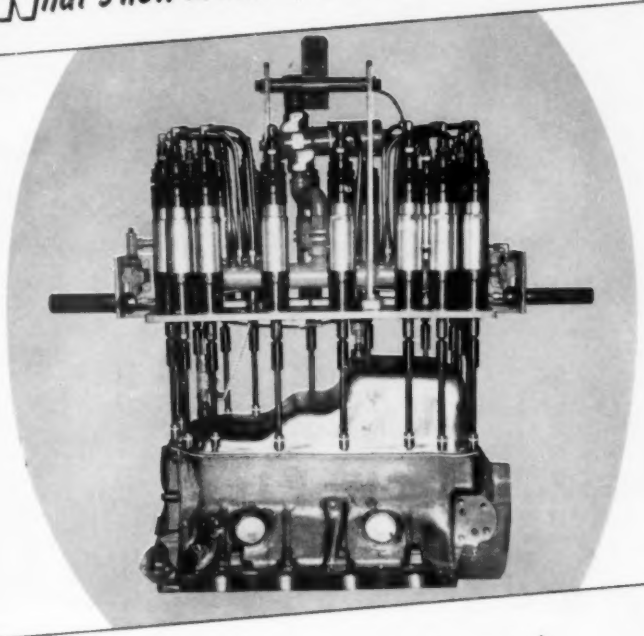
## FURTHER DEVELOPMENTS IN AUTOMATIC PROCESSING

Reports of new developments in the area of automatic processing continue to pile up. For example, a high-speed electronic system that logs a plant's operating data and adds it up at the end of the day, meanwhile keeping a quality check was recently announced by Minneapolis-Honeywell Regulator Co.

This new electronic data integrating system was designed by the Industrial Div. engineers for an oil refinery. It is believed to be the first such system incorporated computing and quality evaluation with conventional automatic data-handling.

The new system will gather data for production of a commercial solvent, automatically log such operating data


What's new in multiple spindle nutsetters?



Cleco will display their newest at Booth 688, A.S.T.E. Show, March 19-23

Cleco's automation-minded engineers have created a new multiple spindle unit for use in constant-timed production line assemblies.

Cleco cordially invites you to drop by and see the unit in action at the A.S.T.E. Show, Booth 688. Chances are your imagination and/or Cleco's engineers can show you the very application you need to solve **your** plant's problems.

In case you're not in Chicago for the show, just drop Cleco a line. We'll be glad to furnish you full particulars.

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***MARKS 7500 PIECES PER HOUR***

Capable of speed-marking 7500 parts per hour, this hopper and dial feed machine is just about the nearest thing to automation in marking. As illustrated above, Model 435 features a vibratory parts feeder, 30" bowl and a dual track carrier. Parts are fed to the machine from the bowl, then permanently marked and automatically ejected. Spring pressure controls depth of mark and insures clear uniform imprint. Ideal for speed-marking solid, round, heavy walled or conical parts. Like all Noblewest Roll-Marking equipment, it produces permanent deep impressions . . . good for the life of your product . . . at *faster speed and lower cost.* For detailed information write Noble & Westbrook Mfg. Co., 16 Westbrook St., East Hartford 8, Connecticut.

*Noblewest is equally famed for its fine marking dies.*

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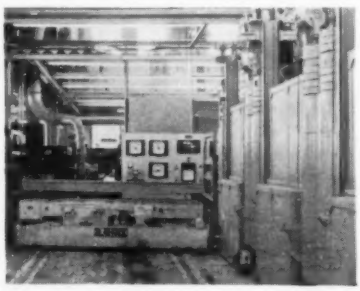
as temperature, pressure, flow, power consumption and product quality. It will store up running figures for flow and power used and total them at the end of the day, the computation being done electronically.

Data, translated into numbers is fed automatically to electric typewriters. Flow and power measurements are also punched on tape for later use in cost accounting. When not actually recording, the system monitors a number of critical points, keeping track of conditions and picking up any deviations as they arise. These are immediately spotted on an annunciator panel at the operator's desk. Quality, in this case purity of the solvent, is measured by converting the desired quality into an electrical signal. This is constantly picked off by recording machines. If it slips below desired characteristics, an alarm sounds.

ANOTHER NEW DEVELOPMENT, a robot car of the Sunday supplement type, is completely controlled by a programming panel. The device, shown in the accompanying illustration, is for the purpose of shuffling racks of electrical transformers in and out of a battery of heat treating ovens. Kingpin in this completely automatic system of heat treating and varnish impregnation of small transformers, is this driverless car, whose movements are unpredictable as they are controlled by a complex programming panel. In use at the General Electric Co.'s Specialty Transformer Dept. in Fort Wayne, Indiana, the system was devised by engineers of GE and the Blaw-Knox Co.



**Car racks transformers automatically in and out of ovens.**

Another advanced feature of the installation is automatic radioactive level controls which establishes volume of varnish necessary and fills the impregnator to that level. This is credited with securing a high uniformity in production of transformers. Other quality gains are secured as well.

THE TREND to replacement of fallible human judgement with precise automatic controls is illustrated in various

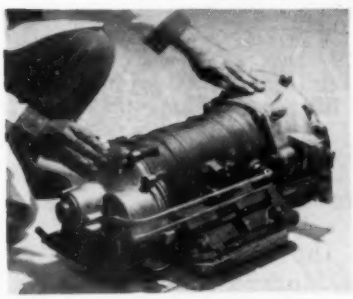
other applications also. Douglas Aircraft has developed a new cleaning and treating machine termed an Auto Cycler. This embodies a new concept of treating stationary parts with solutions in a continuous automatic cycle of operations. All these steps required for prevention of corrosion and abrasion of aircraft aluminum parts and surface treatment for good paint adhesion are accomplished in the cycle. The job is completed in two-thirds the time formerly used and in only two tanks compared with ten immersion tanks formerly required.

## TREND TO ALUMINUM IN AUTOMOTIVE DESIGN

According to a recent survey, aluminum usage in automobiles has taken a jump in recent years. The climb was from 29.6 lb in 1955 to 35.2 lb in 1956 models, and further increase is expected. Much of the popularity of aluminum for trim can be attributed to a new method of color treatment which results in permanent metallic colors. The new process provides trims for interior and exterior, simulating gold, copper, silver, platinum and chromium in addition to conventional colors.

According to the Aluminum Co. of America, about 50 percent of the aluminum in cars is going into automatic transmissions. Another major application is in the engine, now utilizing 30 percent of the total. Body trim accounts for another 7 percent with the balance going into miscellaneous uses such as wiring, brakes, power steering and air conditioning units.

Of interest to tool engineers is the fact that by weight the growing use of aluminum is largely in die castings and impact extrusions. On the basis of present experimental work, the use of aluminum in radiator fins joined to brass tubing is forecast with the possibility of all-aluminum radiators an eventuality. Engine blocks are another distinct possibility as a result of advances.



**Aluminum fly wheel housing and rear bearing retainer, indicated by mechanic, are used in '56 Pontiac Transmission**

## ADVANCES IN PLASTIC TOOLING

Word is being received of numerous interesting and forward-looking applications of plastics in tooling. One of these is drop hammer dies constructed of Kirksite bodies and capped with a one-inch layer of epoxy resin compounds. Such dies, developed by the plastics group of the Manufacturing Research and Development Dept. of Republic Aviation Corp. have been found to be suitable for forming duct halves, beads, angles, channels and shallow pan sections etc. The die face is composed of a rigid epoxy resin compound containing a wear-resistant filler such as aluminum oxide. A resilient epoxy compound is used for the punch face.

The resilient compound is based on a combination of a liquid epoxy resin with a liquid polysulfide polymer. It cures at room temperature, with a catalyst to a tough resilient material able to absorb severe impact stresses of drop hammer operations. The advantage of the development is the minimizing of wrinkling in aluminum and steel parts. The polymers used in these combinations are manufactured by Thiokol Chemical Corp.

Another innovation in plastic tooling techniques is the use of a thin plastic film stretched over a master pattern as an effective parting agent during casting or laminating of the plastic tools. This method has been perfected by the manufacturing research and development department of Republic Aviation. The tendency of plastic resins to stick to the pattern on setting has been something of a problem. Sometimes it has necessitated reworking a pattern on finishing. Now, before pouring or laminating the plastic material, the toolroom stretches a 0.005 inch vinyl plastic film over the pattern and tapes it down, as shown in the illustration. On cooling, the pattern separates cleanly from the cast plastic.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# HY-PRO REVOLUTIONIZES TAP PRODUCTION WITH EXCLUSIVE 3-WAY QUALITY CONTROL

**1. Heat-Treating**—Hy-Pro's new heat treating installation—the industry's most advanced equipment—guarantees you the hardest, toughest taps yet achieved with unvarying perfection.

**2. Electronic Analyzer**—When a Hy-Pro tap is put in this machine, its structure must conform to the most rigid Hy-Pro standards—or it is electronically rejected. *All* Hy-Pro taps are subjected to electronic analysis.

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Now, Hy-Pro—the tap specialists and traditional leaders in tap quality—have developed a new and *exclusive* 3-way quality control. Here are the three steps:

The first is the industry's most advanced Heat-Treating installation, which guarantees you the hardest, toughest taps.

The second Hy-Pro marvel is its new Electronic Analyzer, which examines the structure of a tap without ever touching it. That's why Hy-Pro taps can produce more holes per tap at the lowest cost per tapped hole.

The third installation is Hy-Pro's new Micro-Hardness Tester. Hy-Pro taps are microscopically examined for metallurgical uniformity on both interior sections and surfaces.

And you get the benefit of these new Hy-Pro developments at no extra cost to you. Get in touch with your nearest Hy-Pro distributor, or call us direct. Hy-Pro costs no more.

**3. Micro-Hardness Tester**—Hy-Pro taps undergo the only known microscopic examinations of metallurgical structure on both interior sections and top surfaces. Even the extreme cutting edges are checked to within one-half of one thousandth of an inch.

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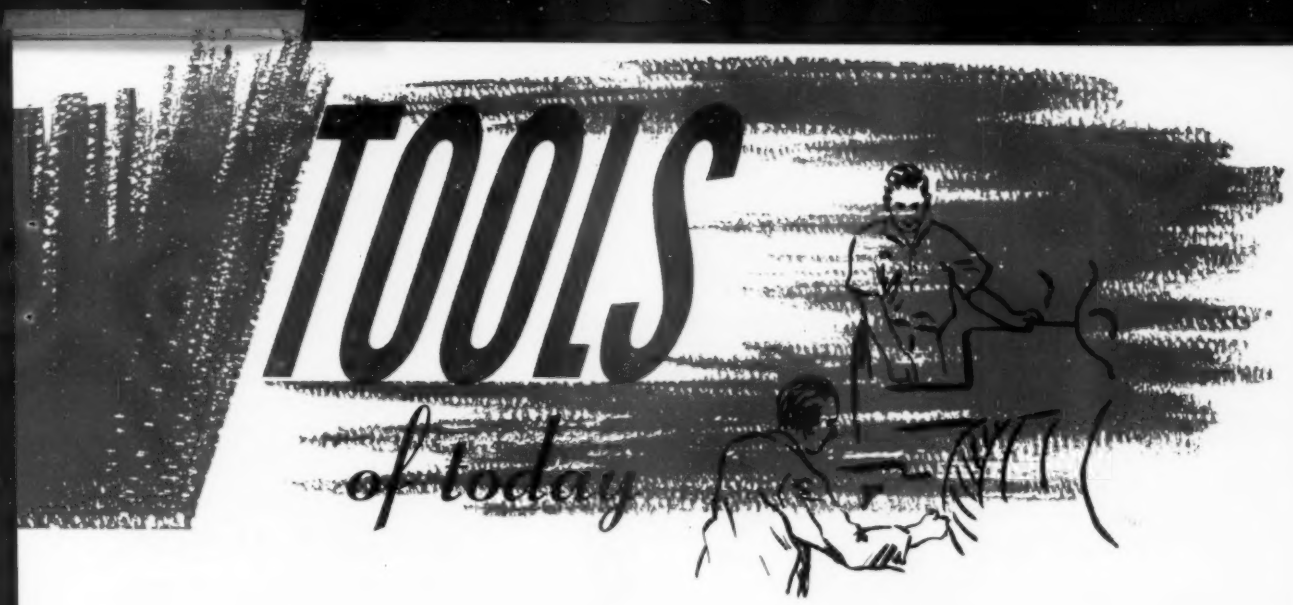
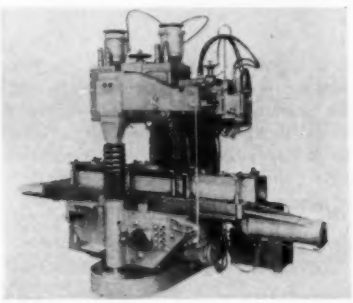



## Die Sinking Machine

Automatic hydrocopy die sinking machines combine high accuracy and fine finish while providing automation of the die sinking and copy milling process. Direct results are a considerable boost in production speed and a significant drop in bench time.

Six different models provide a choice of 1, 2, 4 or 6-spindle machines. Operation of all models is basically the same. The illustrated KA 200/—2 is typical. This is a two-spindle model in which the tracer head is rigidly connected to the milling head, eliminating



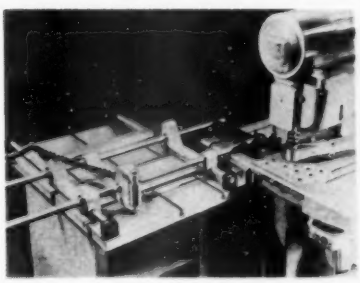
any movement error between the two heads. This and other rigid die sinkers will copy workpieces from masters to a normal working accuracy of ±0.002 in. Closer tolerances can also be maintained. Vertical and longitudinal movements are made by the table and transverse movements by the milling head. All three are hydraulically actuated and fully automatic. Line milling has feed increment at both ends of the stroke. Accurate copying is possible even on dies and molds with deep cavities and steep angles up to 90 deg.

Pressure on the tracer is adjustable from 0.5 to 1.5 lb. This control prevents wear on plastic, plaster or wooden molds and patterns and permits their use on a production basis. The machine can be supplied with a 360-deg plus depth profiler head with automatic control for both profile and line milling. Conventional milling with mechanical table feeds can also be performed when desired. A reverse image attachment permits production of left and right parts from the same master.

Cosa Corp., 405 Lexington Ave., New York, N. Y. **T-3-2591**

## Positive Duplicator

Pantograph-like mechanical device quickly and easily locates holes in simple or complicated patterns and actuates the punching mechanism with extreme accuracy. Designed for use with the Wales Fabricator, it consists of a one-piece steel worktable with accurately machined surface and T-slots running



across both dimensions for clamping templates in position. It is mounted on a heavy steel plate base skirt, with two steel shelves making a handy tool storage rack. It is securely bolted to the left side of the fabricator worktable.

On each side of the table is a hardened and ground bar on which a carriage assembly rides for forward and backward positioning. This carriage contains bearing supports for two hardened and ground traverse rods for lateral positioning. On the extreme inner end of these traverse rods, outside the carriage assembly and over the worktable, are mounted adjustable quick-action clamps for securing the workpiece in position.

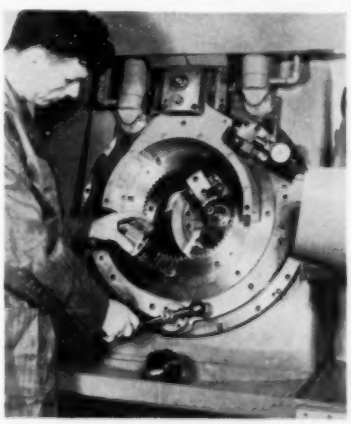
Rolling on special ball bearings, the locator carriage assembly is smoothly and effortlessly moved in any direction. The workpiece, securely held by the clamps, is automatically moved simultaneously into position under the punching mechanism of the press. As each hole is located the operator simply depresses the locator pin into the template aperture. This automatically closes a switch in the locator assembly and actuates the punch.

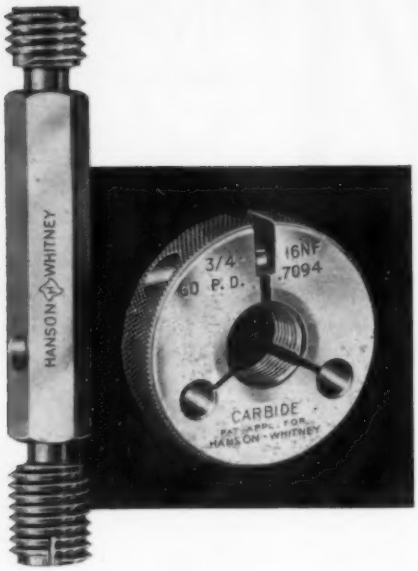
Wales-Strippit Corp., North Tonawanda, N. Y. **T-3-2592**

## Shaving Machine

High-speed planetary shaver produces uniform, accurate, thin-tooth sections in the flanks of spur gear teeth.

The process was developed to meet the need for a high-production method that would produce spur gear thin-



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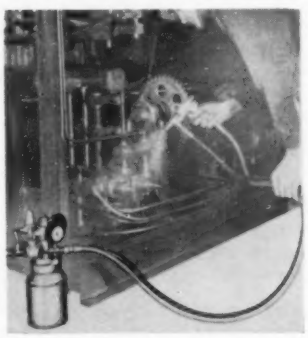
tooth sections having uniformity; accuracy of form, depth, width and concentricity; a high-quality surface finish; and a sharp step at the edges of the section. When a thin-tooth section of this type is provided in a transmission clutch gear, all tendencies of the transmission to slip out of gear are avoided.

A variety of thin-tooth section edge shapes can be produced, to suit the requirements for shifting of particular transmissions. The thin-tooth section can be produced in either one or both sides of all of the teeth of a spur gear.

National Broach & Machine Co., 5600 St. Jean, Detroit 13, Mich. **T-3-2601**

## Spray-Gun Tank

Pressure tank with an air-motored agitator to maintain continuous agitation of finish, while the spray operator works, is claimed to be the smallest practical pressure tank with built-in air driven agitator. This new model comes



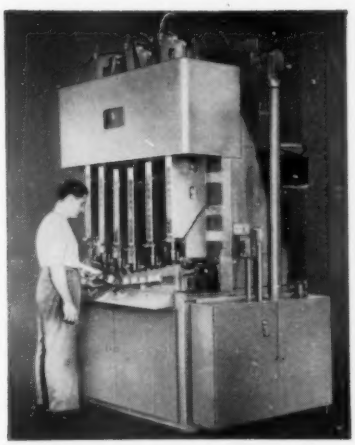
in one, two or four-quart sizes. It permits complete freedom of movement by the operator. It may be used with any make spray gun. Since its agitator keeps the spray material continuously mixed, the new mite-sized pressure tank is particularly suitable for handling quick settling finishes, metallics, molded plastic coatings, etc.

Eclipse Air Brush Co., 390 Park Ave., Newark, N. J. **T-3-2602**

## Stud Driving Machine

A number of studs can be driven simultaneously at various angles up to 30 deg from vertical and at various heights up to 12 in. above the table by a new line of universal stud driving machines. Two models, one drives 1 to 6 studs and one drives up to 12 studs simultaneously in four to six-second cycles.

The machine is extremely flexible and all heads can be changed to a new pattern in less than an hour. Vibrator hopper feed sorts and delivers the studs to the positioning fingers, ready to drive. To compensate for distortion in die-cast components being produced, the



components are clamped in place in a resin mold by from one to six self-locking hydraulic clamps. Each head is driven by a separate motor with its own interlocking control circuit and can be made inoperative.

Because of the wide flexibility, these new stud driving machines are not special machines but can be used for any production stud driving job.

Syracuse Special Machine Co., 2900 Erie Blvd., E., Syracuse 3, N. Y. **T-3-2611**

## Lock and Eject Adjustable Adapters

Lock and eject adjustable adapters, designed for use on multiple-spindle machines drilling, tapping, and similar jobs, indicate that setup time can be reduced as much as 30 percent by application of these new tools.

High holding power, accuracy, quick and easy adjustment, and trouble-free operation are features of these new tools. To change a tool, the operator merely turns the threaded nut to unseat the chuck wihch grips the cutting tool. When the new tool is in place, the nut is turned to its locking position and there is no need for pounding or excessive torsion to lock the tool in place. The threaded nut is fitted with spanner wrench holes on its outside diameter as well as its face, to speed tool changes.

A new four-slot design lock and eject chuck furnishes four-way gripping action with a true collet effect to hold the cutting tool in place and reduce damage due to pull-out even on deep oil hole drilling or crankshafts. These tools are made with a degree of accuracy which allows cutting tools to run true within 0.002 in. A wide range of sizes of drills, reamers, and taps may be accommodated by simply changing chucks in the lock and eject adapters.

Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8, Ill. **T-3-2612**

## Plastic Tool Materials

Tools with surfaces exceptionally able to withstand hard wear are provided by three new epoxy-resin formulations, die laminating resin 602, die surface casting resin 612-B, and die surface coat resin 613. These Marbelette materials permit the fabrication of tools and dies without application of heat, since they set at room temperature with the aid of an accelerator.

All three resins offer high abrasion resistance. The 602 epoxy was especially tailored to meet the need for a laminating resin in applications where extreme wear is anticipated, as in draw dies and other metal-forming tools, routing fixtures, and foundry dies.

Resin 602, which can be stored unrefrigerated for long periods, combines with hardener 680 to provide a mixture of very low viscosity. It wets fibrous glass instantly to create a bond that will not delaminate. Tests of reinforced plastic tools made with laminates of this resin demonstrate dimensional stability and good chemical resistance among their many desirable characteristics.

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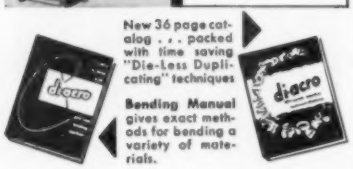
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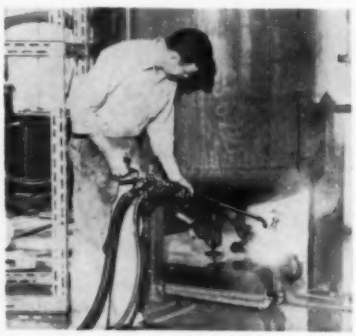
Marblette Corp., 37-21 Thirtieth St., Long Island City 1, N. Y. **T-3-2621**

## Steam Gun

Designed for steam cleaning efficiency, cool handling, and easy operation, this solution-lifting steam gun protects the operator from the heat of the steam. Where other similar steam cleaning devices have had separate tubes for solution and steam, the Oakite Hurriclean gun uses a tube within a tube. Steam passes through the insulated interior tube, solution through the exterior. The steam loses none of its heat, but the cleaning solution reduces the external temperature of the gun.



Solution is automatically drawn into the nozzle of the gun by the partial vacuum created by the steam passing through. Another feature of the gun is the sealed rotary joint which makes it possible to rotate the nozzle without twisting heavy solution or steam hose. While the forward end of the gun revolves to clean at any desired angle, the handle and hose connections remain stationary. Operator fatigue is further reduced by designing the gun so the thrust of the steam is taken between the handles.

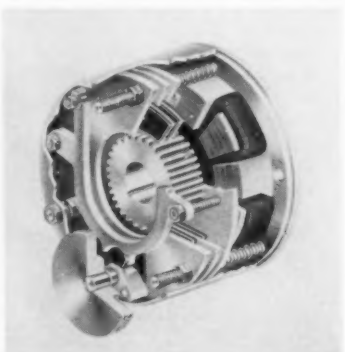
Gun is precision made with a cast aluminum spade type rear handle, cast brass valves, stainless steel outer and inner tubes and nozzle, and an oil-resistant forward rubber grip. The gun weighs 6¾ lb in its 3½-ft length, and slightly more in the 5 ft size. Maintenance of the gun is simple, there are no moving parts except the brass valves and the sealed rotary joint. Because solution goes through the tube at a comparatively low temperature, there is little danger of clogging or scaling up. The nozzle is protected from rough treatment by an added stainless steel tip.

Oakite Products, Inc., 58 Rector St., New York 6, N. Y. **T-3-2622**

## Electric Brake

This electric brake requires little adjustment and maintenance. Designated series E, the device features a magnet with a circumferentially wound core and armature which reduces power losses by 80 percent compared with the usual designs.

Another advantage is high pull-in force at large air gaps. This is important in electric brakes because brake



lining wear causes the armature to recede from the pole faces. To make the unit adaptable to practically any application where an electric brake is required, the manual release is located off-center to permit two-end shaft mounting. By an ingenious arrangement of two release pins which are a part of the manual release, a limit stop for the magnet armature is provided; the pins keep the armature from being displaced so far that the magnet cannot pick it up.

High-friction brake linings are bonded to both sides of aluminum disks spline-mounted on the drive shaft to which braking action is to be applied. When the linings wear out, the entire disk is replaced. The brake is designed to fit standard C-face brackets from 182 to 445 frames.

Star-Kimble Motor Div., Miehle Printing Press & Mfg. Co., 200 Bloomfield Ave., Bloomfield, N. J. **T-3-2623**

## Photosensitive Plates

Photosensitive anodized aluminum plates, with thicknesses of 0.064 in. can be processed using standard photographic solutions and techniques. Previously, these plates have been available in thicknesses limited to 0.020 in.

Called Metalphoto plates, they are utilized for producing photographically on metal, wiring diagrams, dial faces, instruction panels, and the like. Because the legend is imbedded in the anodized layer of the aluminum, great resistance to abrasion, acids, alkalis, and temperatures up to 1000 F, has been an important feature. Panel faces made from these plates can mount rheostats.

Metalphoto Corp., 6811 Superior Ave., Cleveland, Ohio. **T-3-2631**

## Air-Powered Presses

Small, low-cost production presses in 75 and 100-ton sizes are available with either hand lever or optional electric pushbutton control. Photo shows a 75-ton Hydrolair equipped with electrical controls.

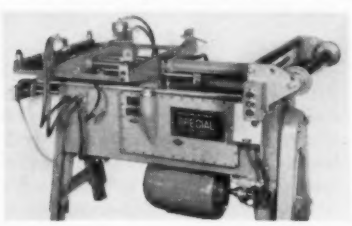
The press has neither motors nor pumps, its special hydraulic intensifier is powered by compressed air, regular "shop air" in most installations, maintaining any preset pressure for as long

as desired, without attention from the operator. Among the many uses of the press are plastics molding, rubber molding, compacting, laminating, assembly, forming, bluing, and laboratory test work.

American Steel Foundries, Elmes Engineering Div., 1150-Z Tennessee Ave., Cincinnati 29, Ohio. **T-3-2632**

## Press Feed

Hydraulic gripper type punch press feed units for the automatic feeding of coiled stock are available for handling stock up to 36 in. wide x 3/16 in. thick



for feed lengths up to 36 in. long. All models are adjustable to take narrow width stock, and for infinite feed stroke length from 0 to maximum.

A limit switch, mounted on the press and actuated by any moving part of the press or die timed with the ram, energizes a solenoid which starts the feeding cycle. Stock is fed on the upstroke of the press.

Special Engineering Service, Inc., 8161 Livernois, Detroit 4, Mich. **T-3-2633**

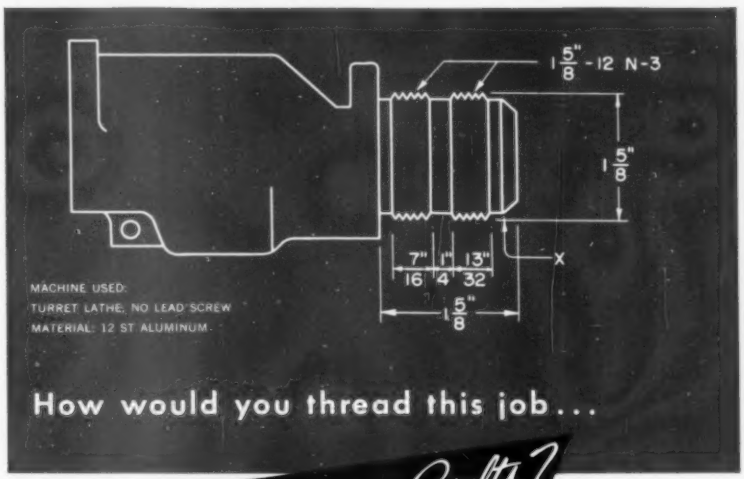
## Slide Rule

Light-alloy slide rule made in green-yellow eliminates violet and red rays which focus in front of and behind retina. Green-yellow shade coincides with optimum sight point of the spectrum, cuts eyestrain, blurring and errors in reading calibrations. Noncorrosive, nonrusting metal construction eliminates warping, swelling and binding. Made in 6 and 10-in. trig, log-log standard rules, or in rules made to special order.

Pickett & Eckel, Inc., 1109 S. Fremont Ave., Alhambra, Calif. **T-3-2634**

## Electro Spark Tool Sharpener

Method X offhand tool sharpener, an electro spark process for sharpening and modifying cutting tools, removes both carbide and shank simultaneously. Metal is removed from the tool by an electric spark crossing the gap between a cast-iron wheel, acting as the electrode, and the tool which is separated from the wheel by a semisolid dielectric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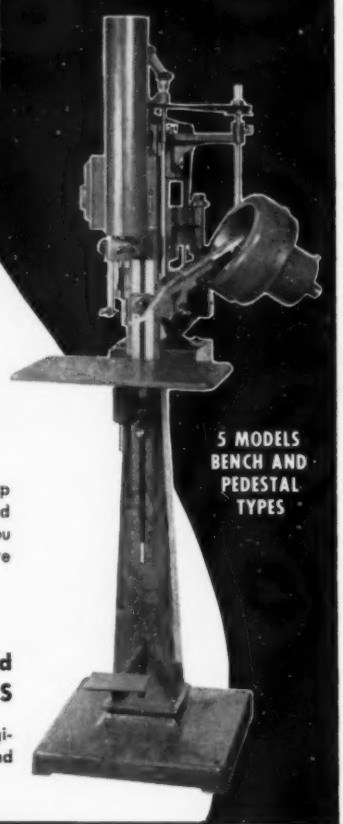


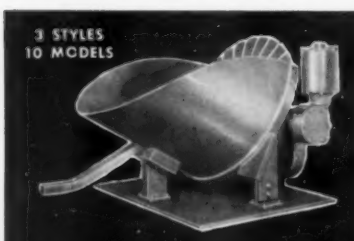


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film. Because the film prevents contact between the wheel and tool, wheel wear is negligible, and damage to wheel or tool is impossible.

The sharpener eliminates the need for diamond or any other abrasive grinding, effecting reduced tool maintenance costs. Metal removal is accomplished, in most cases, in less time than with conventional methods. Both roughing and finishing are performed on the same wheel.

Ex-Cell-O Corp., Detroit, Mich. **T-3-2641**

## Hydraulic Cylinder

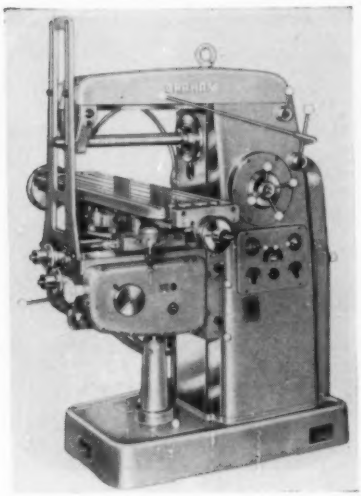
Double-acting hydraulic press cylinder has a 16-in. bore x 36-in. stroke and operates at pressures up to 2000 psi. The cast steel front head with reverse,

round flange mounting is welded to the forged steel cylinder. The rear head is bolted to the cylinder. Bearing bronze bushings in the front head and on the piston, guide the ram and piston assembly. The cylinder has 1¼-in. pipe tap flanges. Net weight of the unit is 5100 lb.

The Oilgear Co., 1599 C West Pierce Street, Milwaukee 4, Wis. **T-3-2642**

## Universal Milling Machine

No. 2RL milling machine features dial-type speed and feed selectors as well as forward and reverse rapid traverse in all three directions. The spindle is mounted in precision tapered roller bearings. A wide range of spindle speeds from 52 to 1500 rpm assures correct and efficient cutting speeds for all



materials. Separate geared speed and feed drives are provided for simple and safe setups.

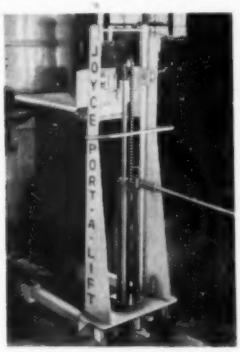
All moving parts including hardened and ground gears operate in oil bath with visual control. The table leadscrew runs in its own oil reservoir assuring minimum wear and prolonged accuracy.

Graham Machine Tool Co., 19 Cleveland Place, New York 12, N. Y.

**T-3-2651**

## Material Handler

Loading and unloading trucks as well as providing an adjustable, portable feed table for production machinery and for retooling are applications of the Port-A-Lift. The unit is lightweight welded steel construction. The 24 by 24-in. nonskid platform can safely handle bulk or palletized material. Waist-high controls pro-




vide instant and accurate raising and lowering of loads.

The Port-A-Lift is powered by a hydraulic jacking unit. A foot brake, located directly under the jacking unit prevents moving while being loaded or unloaded.

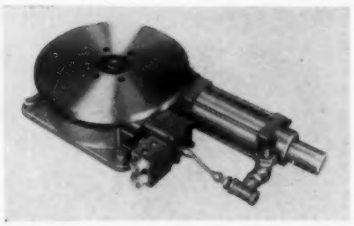
Joyce-Cridland Co., Dayton, O.

**T-3-2652**

## Rotary Index

Built-in automatic switch actuators are an optional feature in this air-powered rotary index table. The actuating rods and switches control the main work operation, the positive locking of the table itself, and related movements such as work-holding devices, feeders, etc.

The unit has a 12-in. dia, ¾ in. thick steel table top supported by a wide lubricated peripheral bearing near the edge. Without disturbing the table top, it can be set to provide 4, 6, 8, 12, or 24 stations. It can operate up to 150 index



movements per minute at 24 station setting.

Override or skipping of stations is impossible as the index cylinder piston seats against the cylinder head at the

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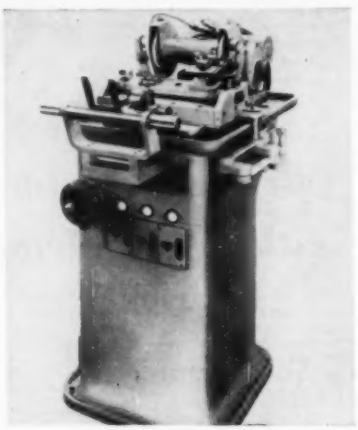
completion of any index movement. Loads up to 500 lb can be carried without jarring due to an adjustable air cushion device at the head of the index cylinder.

A locking wedge actuated by a separate air cylinder provides positive repetitive stops within 0.002 in. at edge of table. A $\frac{5}{8}$-in. ID access hole is provided in the Timken roller bearing equipped center post to permit passage of piping or wiring to the table top. Hydraulic powered models are also available.

General Automation Products Co., P. O. Box 14, Birmingham, Mich. **T-3-2661**

## Grinding Machine

Copy grinding machine permits simultaneous grinding of two duplicate lathe tools, form tools, profile gages, or production parts in one simple operation. An easily made template, enlarged 5 times, effects the copying proc-



ess through a parallelogram linkage to the twin toolholders holding the workpieces. A pair of diamond dressers keeps the wheels trued for accurate grinding. A cylindrical grinding attachment which permits grinding of circular pieces up to 4 in. in diameter is also available.

Carl Hirschmann Co., Inc., 30 Park Ave., Manhasset, N. Y. **T-3-2662**

## Coolant Pump

This pump has a bronze pump housing, impeller and shafts permitting a much longer life than is possible with cast-iron type units. The unit will pump coolants, cutting oils, soluble compounds and many liquids to milling machines, lathes, presses, cutoff machines, belt sanders, grinders, etc., or any other machine requiring copious quantities of liquid.

Slow speed oversize motor is used for quietness and extra long life. This unit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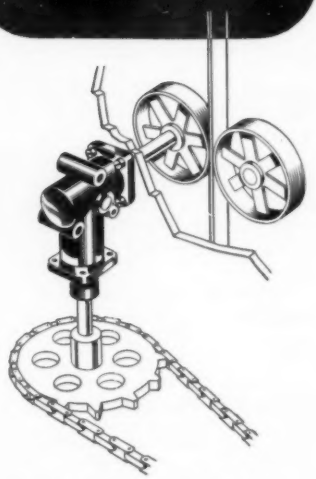

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Models 340 (2-way) and 350 (3-way), rated at 3 hp at 1200 rpm, will transmit a maximum static torque of 2500 lb. in. Constructed with durable Coniflex* gears and lubricated for life, precision-made ANGLgears are the most versatile right-angle units available.

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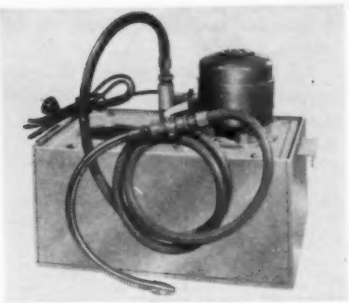


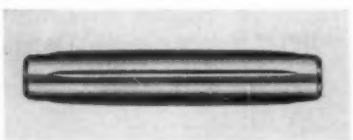
comes complete with 6 feet of flexible hose, 17-in. flexible nozzle with shutoff valve; 8 feet of rubber cord with cord and plugs is also furnished. A five-gallon tank is furnished as standard.

Sutton Mfg. Corp., Norfolk, Va.

**T-3-2671**

## Self-Locking Pin

Designed for hopper feeding or insertion in a drilled hole, the Type U self-locking Driv-Lok pin features a pilot on each end, permitting fast insertion and easy, accurate starting of either end of the pin.



The pin is provided with full-length grooves to give maximum locking effect. It is used as a substitute for taper pins in keying sprockets, gears, collars, knobs, handles, levers and wheels to their shafts. Many other assembly operations can be done with less labor and time.

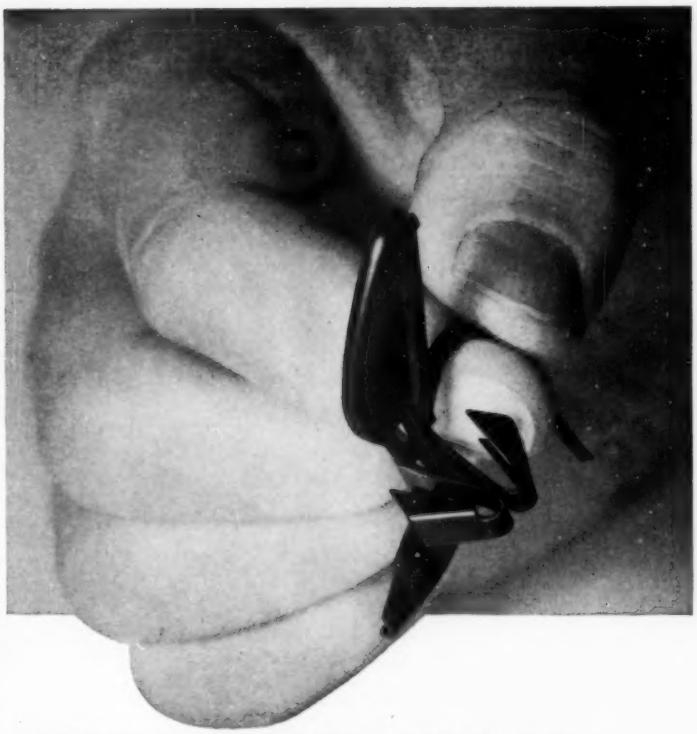
Parallel equally spaced grooves are impressed on the shank of the pin, displacing a predetermined amount of metal to each side of the cut to form a raised flute. When the pin is driven into a hole of the same nominal diameter as the shank, the flutes are compressed against the hole wall, creating a radial holding force. Type U pins are available in a wide range of sizes and materials.

Driv-Lok Pin Co., Sycamore, Ill.

**T-3-2672**

## Angular Centering Reel

Lateral adjustment for angular feeding of coil stock is a new feature of this reel. Lateral adjustment can be made easily by rotating a crank at the rear of the reel. The crank actuates a leadscrew which moves the entire reel into location. The crank can be operated by hand or motorized. Lateral adjustment assures alignment of the coil stock with

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Mass production of body trim clips for a leading make automobile proved a complex forming problem. A. H. Nilson's 4-Slide (Model S-4-T) did the job, forming .025" x 3", 1065 C.R.A. steel at 54 strokes per minute! Accurate, fast, and automatic, Nilson 4-Slides keep pace with one of the nation's biggest industries.

**THIS ONE WAS EASY . . .**

A Nilson 4-Slide, Number 1, forms 150 drapery hooks per minute from 0.70 basic steel wire. Nilson 4-Slides form wire or ribbon stock from the coil. They straighten, feed, pierce, blank, swage, stamp or coin, cut and form in one, fast, automatic operation . . . accommodate wire up to .5" dia., in feeds to 32" max., and ribbon up to 3.5" wide. Press sections from 5 to 75 tons.

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the die for feeding coil stock inclined presses.

All controls are grouped to permit one-man operation. Being power-driven at a controlled rate, jerking and overrunning are eliminated. Expander arms are operated by power to handle the

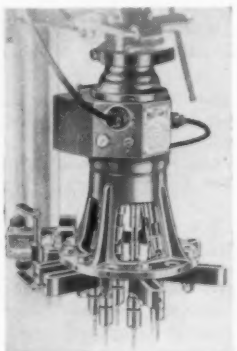
problem of variations in inside diameters of coils. They will accommodate center ID's from 15 to 28 in. without resorting to adapters. The construction and design of the expander arms permits trouble-free and easy loading.

Stock flow is controlled by a simple loop control. Uncoiling of the stock is started by pressing a button. The high-torque variable-speed drive is reversible with automatic braking to assure rapid starting and stopping. The reel can be operated in either a clockwise or counterclockwise direction.

Sesco Inc., 8881 Central Ave., Detroit 4, Mich. **T-3-2681**

## Multiple-Spindle Tapping Attachment

This Multi-Tapper is a universally adjustable multiple-spindle tapping attachment for any drill press. It permits up to 8 holes to be tapped at one stroke.



A pitch compensating feature for the spindles permits simultaneous tapping with taps of different pitch.

Commander Mfg. Co., 4225 W. Kinzie, Chicago 24, Ill. **T-3-2682**

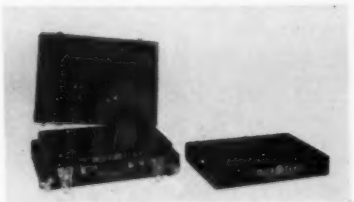
## Automatic Counter

Automatic counter for screw machines counts only full-length parts and serves to minimize lost time on screw machines by sounding an alarm when

the machine is running without bar stock. Through this arrangement, it frees the machine operator for work on other machines, yet notifies him immediately when stock must be replenished.

Count O Larm Co., 1271 W. North Ave., Chicago 22, Ill. **T-3-2691**

## Toolmakers Flat



Small plate for bench use, known as the Toolmakers Flat, measures 8 by 12 by 2 in., weighs 15 lb and is finished to an over-all accuracy of 0.0002 in. The carrying case has been designed with a detachable cover, enabling the use of the plate without removing it from the case.

Collins Microflat Co., 2326 E. 8th St., Los Angeles, Calif. **T-3-2692**

## Four-Way Valve

Double-solenoid, pilot-operated four-way valve, requiring only momentary electrical contact for operation and capable of controlling up to 600 cycles per minute, is built to JIC standards. With pilot solenoids and valve fully enclosed, the unit is both moisture and dust-proof. Solenoid coils, completely covered with molded epoxy resin, are unaffected by oil or moisture. Since the valve is a machined casting of Navy M bronze and valve stem is hard chrome-plated stainless steel, the unit is

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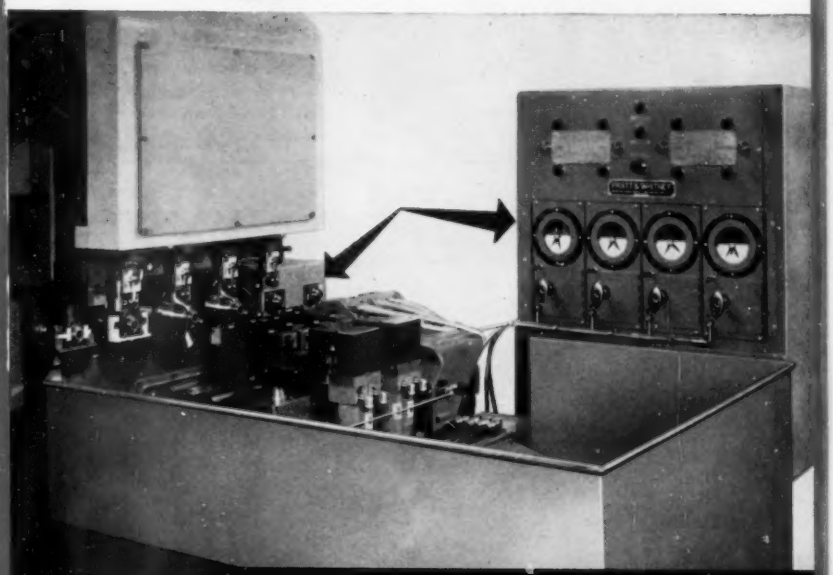

Applied to a New Britain-Gridley Automatic Dual Boring Machine, Pratt & Whitney AUTOMATION GAGING provides in-process gaging plus "feed-back" control for automatic tool resetting.

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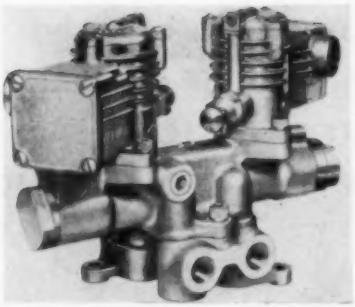

highly resistant to corrosion. Valves are bubble-tested under water. Pilot plungers and valve stem are the only moving parts. There are no springs in the main valve.

Called Speed King valves, they are available in ¼, ⅜, ½, ¾ and 1-in. pipe sizes, with foot or sub-base type mounting. Pressure ranges are: 35-200 psi for air and 35-125 psi for oil for both single and double solenoid valves with internal pilot supply; 0-250 air and hydraulic oil for both single and double solenoid valves with external pilot supply; 50-125 water for single and double solenoid valves with internal pilot supply. Pilot solenoid coils operate on either a-c or d-c and any voltage can be furnished; Maximum inrush current is approximately 10 watts.

The stainless steel main valve stem floats on stationary O-ring packers to minimize wear and friction. Repacking, when necessary, can be accomplished without disturbing piping. Pilots and the sub-base mounted valve body can also be replaced without removing piping, thus reducing maintenance down time.

Valvair Corp., 454 Morgan Ave., Akron 11, Ohio. **T-3-2701**


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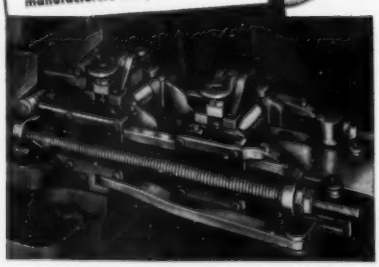
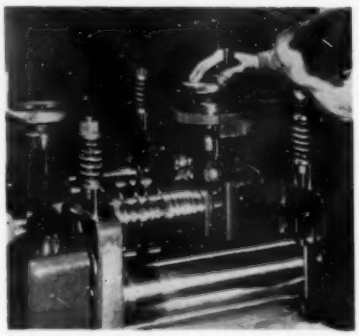



## Precision Slitter

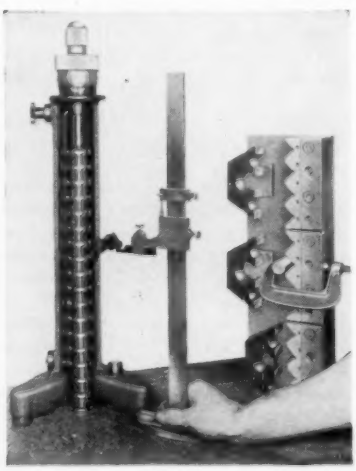


Precision slitting of high temperature alloys is obtained on this rotary gang slitter. The machine slits both coils and sheets in widths of 8 in. and thicknesses of from 0.100 to 0.003 in., holding tolerances as close as plus or minus 0.001 in.

Stanat Mfg. Co., Inc., Long Island City, N. Y. **T-3-2702**

## Medium-Size Gage

Designed for fast, accurate checking of medium-size workpieces, a new 18-in. Pla-Chek gage rounds out the line to the point where there is now a complete range of sizes from the small, portable 6-in. model to the large, 48-in.



model for extremely large workpieces. Intermediate models include 12, 18, 24, and 36-in.

The new model may be accurately set 5 to 20 times faster than other methods of comparable accuracy. From 10 to 15 seconds is usually the required setting time. Accuracy to 0.00005 in. throughout the entire 18-in. range is guaranteed. Since no auxiliary gage blocks are necessary, dimensions may be taken either from the surface plate or from a baseline on the work.

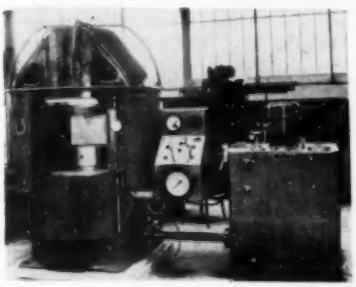
A micrometer thimble, graduated to 0.0001 in., enables dimensions to be taken between the 1-in. steps of the measuring bar. Adjusting the measuring bar up or down permits readings to be taken relative to a center line or other reference line on the work.

Cadillac Gage Co., 25760 Groesbeck Hwy., Warren Twp., Detroit, Mich.

**T-3-2711**

## Hydraulic Hobbing Presses

Line of hydraulic hobbing presses features circuits that permit rapid closing, automatic change-over from high to low speed at the lightest contact between the hob and a die and fine adjustment with the low hobbing speeds. To provide flexibility and a wide variety of applications, automatic change-over from closing to hobbing speeds is adjustable within predetermined limits. As a result it is possible, for example, to push hobbed dies, or matrices, out of holding rings at high speed. Conveniently located controls, pressure gages and indicating lights serve to show progress of the pressing operation.



These presses have capacities from 5000 to 100 tons. Measuring equipment includes a contact manometer that permits preselection of hobbing depth and maximum hobbing pressure. A measuring gage indicates and determines hobbing speed required. A dial indicator graduated in increments of 0.001 in. has a measuring range of two inches—end measures increase this range if desired.

The control box has a removable key starting switch that prevents unauthorized operation and contains connections to the pump and motor drive. Signal lights indicate motor operation and a built-in manometer indicates hydraulic

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at root of ring gages permits wear correction.

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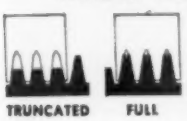


of thread plug at no extra cost. Enables accurate setting and permits easy check for gage wear.

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pressure in psi. Electrical accessories for interior illumination and a gage for measuring the depth of impressions are also contained in the control box. Protective guards consisting of two double plexiglass windows can be rotated around the axis of the press and are spring-suspended.

Haller, Inc., Plymouth, Mich.
**T-3-2721**

## New Taps

Designed to force the chip ahead of the tool, this tap eliminates tap breakage through chip interference. The left-hand flutes feed the coolant or cutting oil downward, assuring a copious supply of cutting compound at the cutting point. This feature dissipates heat and also washes out small particles of metal which tend to cause abrasion and shorten tap life.

Designed to operate at drilling speeds or faster, (2 to 4 times normal tapping speeds) these tools do not bind or seize

in the hole and work equally well in most materials. Lowered production costs through increased speeds are achieved, and lowered tool costs are realized because more finished holes per tool can be threaded. They are interchangeable with standard taps and can be used for any manual or mechanized tapping operation.

Shearcut Tool Co., 7045 Darby Ave., Reseda, Calif. **T-3-2722**

## Toolholders

Complete range of styles and sizes of holders for carbide insert and throwaway carbides can use any of the three tip thicknesses through applying standard carbide shim seats. This means a considerable saving by avoiding the use of a tip that is thicker than necessary for the best efficiency on a particular job.

The new Valenite holder line includes toolroom styles, thus considerably broadening the field to which the throwaway carbide insert idea can be

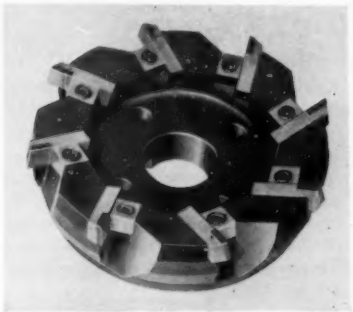
applied. Also there are new styles for machining nonferrous metals, plastics, etc.

A further feature of the new line is a simplified setup for ordering semistandard and special-purpose holders for specific jobs. This is accomplished through the use of standard parts which makes it possible to assemble many different holder combinations without the cost of having holders specially built.

The holders have adjustable chip breakers pinned to the insert clamp so that the chip breaker will not fall out when the tip is changed. This is particularly important when the holder is used in the back tool post of a lathe or vertically as in a Bullard. It also avoids fumbling with the chip breaker when changing inserts and reduces down time for tip changing.

Valenite Metals Corp., Box 205, Royal Oak, Mich. **T-3-2731**

## Milling Cutters

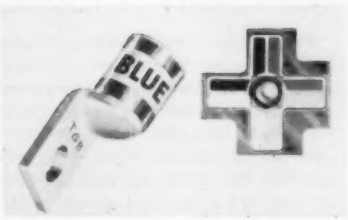


Shell end mill and face milling cutters are designed for faster stock removal and better finish. This is made possible by proper cutting angle and ample chip clearance. The same cutter with the blades changed to the proper grade of carbide can be used for milling all ferrous and nonferrous materials. Low replacement and maintenance costs are a special feature and quick, easy blade adjustments are possible.

Beaver Tool & Engineering Corp., Box 429, Royal Oak, Mich. **T-3-2732**

## Connectors for Copper Conductors

New line of compression connectors for code copper conductors features faster, more economical installation through color coding and hand tooling. The color coding and the hand tool, which are used for the first time on this type fitting, reduce the possibility of error and bring installation time down to seconds. The new line consists of one and two-hole lugs and two-way connectors from 8 AWG to 1000 MCM.

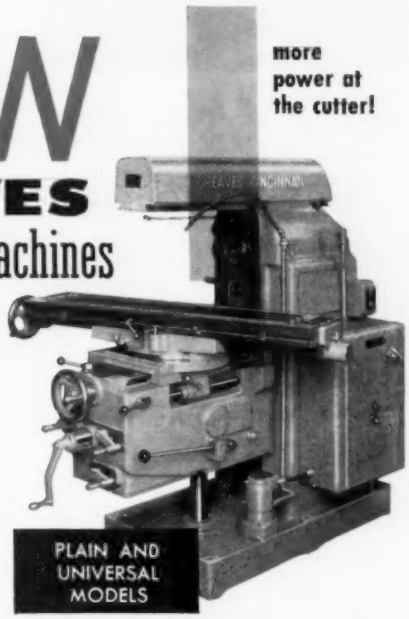



Each connector size is color coded to correspond to a die in the hand tool. Quick and correct selection of a connector and its die for a particular installation is achieved by matching the color. A compact hand tool assures a perfect joint of high pull-out value and low resistance between the fitting and conductor. This assurance plus the color of the fittings, which shows immediately whether or not the proper size is installed, simplify and speed inspection. The copper connectors are tinplated, and have high conductivity and strength. They are drilled to NEMA standards, and have been approved by the Underwriters' Laboratories.

The Thomas & Betts Co., 36 Butler St., Elizabeth, N. J. **T-3-2733**


new
GREAVES
3-XH Milling Machines

more power at the cutter!



PLAIN AND UNIVERSAL MODELS

The completely new GREAVES No. 3-XH Milling Machine brings added versatility, increased operational ease, and more power where it's needed most . . . *at the cutter!*
It utilizes two motors, one for spindle drive; a separate motor for moving table, saddle and knee. Compare this and the other outstanding features of the new Greaves Mill. You'll see why Greaves is "The MOST Mill for the LEAST Money."

*Write for detailed literature!*

- Wide range of speed/feed combinations for any type material, any type job.
- Heavy, internally ribbed column casting and heavy duty rectangular overarm for maximum rigidity.
- Large, heavy-duty knee, saddle and table provide accuracy for all types of milling.
- New 7½ HP spindle drive motor, with separate motor for movable components, provides extra power for heavy milling.
- Easy-to-reach controls. Handwheels and vertical crank disengage automatically when not in use.
- New rapid traverse lever within operating control area.
- Separate drive motor for table, saddle and knee provides more smooth balanced power at the cutter.

GREAVES
MACHINE TOOL DIVISION

J. A. FAY & EGAN COMPANY
2800 Eastern Avenue, Cincinnati 2, Ohio

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-273

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**Available now in 148 low-cost standard sizes to meet your exact requirements!**

"*Versatile!*" Yes, that's one word for Ace Drill Blanks. And "*economical*" is another. Because they're "all-purpose" tools that you can readily use in countless different ways. Properly heat-treated to uniform hardness, then precision ground to size, they're ideal as punches, dowels, knock-out pins, and gages. Perfect for rollers, too, on high temperature applications. And you'll find they can be quickly, easily, economically adapted to a wide range of end-cutting tool applications to save time, step up production, and reduce costs! Call your local distributor . . . or send for complete information today!

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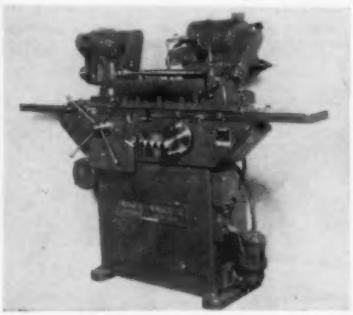
ACE DRILL
ADRIAN, MICHIGAN

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

INDICATE A-3-274-1


## Internal-External Grinder

Combination internal-external grinder obviates the necessity of removing a heavy and somewhat cumbersome spindle, motor and mounting bracket assembly when changing from internal to external operation or vice versa. The combination grinder is basically a 24-in. table travel machine having a 12-in. swing over the table. For external work the capacity between centers is 24 in.



Three types of table feed are incorporated as standard equipment: (1) Hand feed by using the capstan type handwheel; (2) power feed through a gear-driven mechanism electromechanically controlled; (3) reciprocator mechanism where the stroke is adjustable from 0 to 3 in.

Change-over from internal to external operation involves loosening four nuts in the spindle mounting bracket, swiveling the required spindle into position and retightening the nuts. Minor changes in the workhead assembly practically complete the operation.

Changing from either the internal or external spindle requires little effort. Pulleys are mounted on each end of the motor. One takes a cog belt to drive the external spindle and the other a flat belt in conjunction with a spring-loaded idler pulley to drive the internal spindle. When operating as an external grinder the flat belt is removed from the internal spindle and the cog belt is applied to the external spindle.

Parker-Majestic, Inc., 147 Jos. Campau Ave., Detroit 7, Mich. **T-3-274-1**

## Hydraulic Cylinders

Heavy-duty hydraulic cylinders, rated at 2000 psi, are built for dependable performance under severe industrial operations. Specifications include: heavy walled seamless steel tubing micro-honed for minimum friction; rolled steel heads recessed to confine the tube, prevent breathing and provide additional protection against leakage under the most severe usage; piston rods hard chrome-plated, turned, ground and polished from stress relieved high-tensile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Standard COMPONENTS
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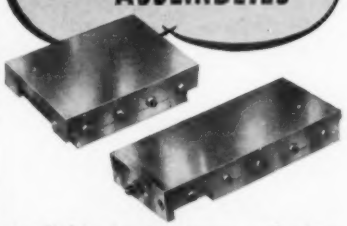
**COMPLETE** your *special* production equipment faster with *standard* components from this extensive line. Highest precision and quality—many sizes available from stock. *Get complete details!*

STANDARD
Slide
ASSEMBLIES



Available in 52 types and sizes. *Basic Type* includes male and female members, gib and gib screws. *Assembled Type* also has return springs, stop screw, Neoprene shield and mounting holes. Sliding surfaces furnished either *Milled* or *Hand Scraped.* Widths from 2" to 6"—lengths from 3" to 16".

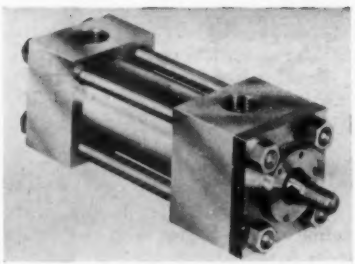
STANDARD
Spindle
ASSEMBLIES

Available in *Collet Type* for ⅛", 3/16" and ¼" max. capacity collets; *Morse Taper Type* for No. 0 and No. 1 Morse taper shanks; and *Arbor Type* for shankless cutters with 0.375" and 0.500" center hole. *Standard Duty* has single row ball bearings at both ends; *Heavy Duty* has double row bearings at front.

*WRITE now for FREE catalog!*

RUSSELL T. GILMAN, Inc.
1250 Milton Ave.
JANESVILLE, WISCONSIN

INDICATE A-3-274-2



steel; multiple-lip self-compensating rod gland packing providing excellent pressure sensitivity with long life. This packing is contained in a removable cartridge which facilitates replacement without disassembling the cylinder. Cylinders are available in bore sizes from 1½ to 8-inch inclusive.

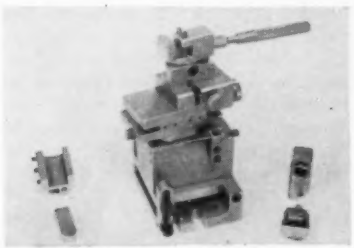
Ortman-Miller Machine Co., 13 143rd St., Hammond, Ind. **T-3-2751**

## All-Purpose Hose

Suitable for use with air, oil, water and mild chemicals, a new hose is being marketed under the trade name of All-flex. This all-purpose hose has extremely long life and nonkinking properties. It is mandrel-made with horizontal braided construction.

Manhattan Rubber Div., Raybestos-Manhattan, Inc., Passaic, N. J. **T-3-2752**

## General Purpose Radius Grinding Fixture



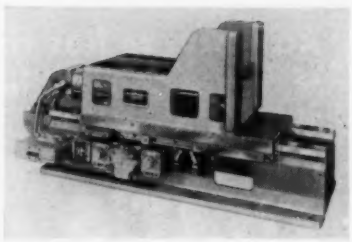
Radius grinding fixture provides for redressing tools. Adapter heads for holding shankless, round shank or square tool bits are interchangeable on the fixture by removing one screw only. This fixture can be used on any in-feed tool and cutter grinder.

Apex Tool & Cutter Co., Shelton, Conn. **T-3-2753**

## Hydraulic Feed Unit

Designed to give balanced thrust, this hydraulic feed unit provides positive control of rapid traverse, fine feed and depth. Depth will repeat within 0.0005 in. The flange is designed to simplify mounting and aligning of multiple-spindle heads, and the 15-in. stroke assures ample tool change clearance. Located above the ways, the power cylinder is accessible for maintenance and the hydraulic control panel can be mounted on either side of the unit. A separate floor type power pack supplies the hydraulic power in compliance with JIC standards.

At 1000 psi, the 4-in. hydraulic cylinder of the Model 405 provides 12,000 lb thrust. Feed rate is infinitely variable from 0 to 24 ipm; rapid advance is 8 ips; and rapid return is 5 ips. Rapid advance and feed stroke lengths are



adjustable to suit, by repositioning control dogs. Multiple spindle drive motors up to 20 hp and 1800 rpm can be mounted on the saddle. Precision hard-

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Here's a real helping hand for that final touch of precision on tools, dies and parts. These oilstone files make the job fast and easy no matter how intricate the surface. A selection of 35 shapes and 97 sizes to choose from. HARD ARKANSAS for superfine finishes.
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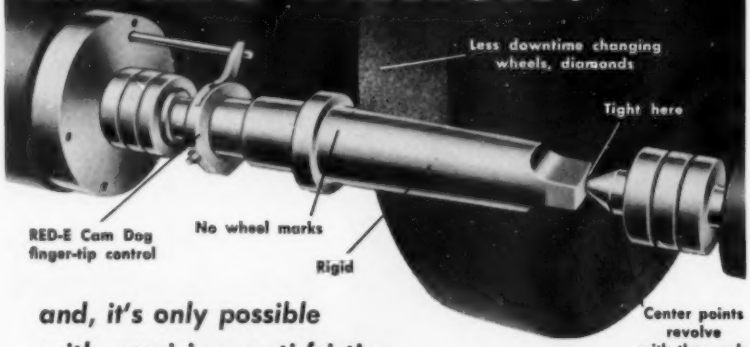


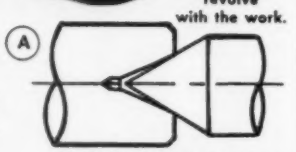

*and, it's only possible with precision, anti-friction*

**RED-E GRINDER CENTERS**

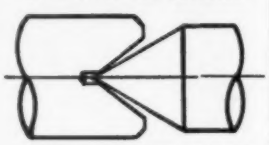
Chatter, wheel marks and out-of-roundness is caused by looseness in the center hole. The center and workpiece must be integral . . . rigid; the point in contact with the largest periphery of the centerhole, as illustrated in (a). Likewise, the bearing assembly must be able to provide great radial and thrust load capacities, with a minimum deflection under continuous operation.

If you're using anything but RED-E it's costing you money and you're not getting micro-finish!

*Help yourself to super finishes. Read the new RED-E booklet "A New Concept In The Art of Grinding." Ask your Industrial Distributor for a copy today, or write direct.*

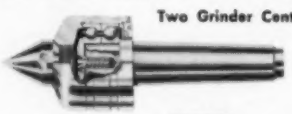



CORRECT CENTER CONTACT

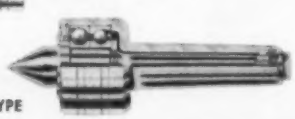


INCORRECT CENTER CONTACT

Two Grinder Center Types



SHANK TYPE



SPINDLE TYPE

**Only RED-E GRINDER CENTERS are constructed to meet these requirements because:**

1. Bearing assemblies are locked in, Duplex ABEC-7 spec, Precision, Preloaded, Angular Contact New Departure ball bearings.
2. Points are of High Speed Steel, ground 60 degrees, 30 minutes included angle.
3. Lubricated for life.
4. Labyrinth enclosure keeps out all coolants.
5. Guaranteed.

**TAPERS AVAILABLE**

| | Morse | B&S | Jarno | Norton | Landis |
|---|---|---|---|---|---|
| SHANK | 1 to 6 | 5 to 15 | 4 to 20 | 10 to 16 | .8125, 1.335, 1.750 |
| SPINDLE | 2 to 7 | 7 to 18 | 6 to 20 | 10 to 24 | .8125, 1.335, 1.750 |

*Special heads, tapers, shanks and points made to order.*

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RED-E-TOOLS **READY TOOL COMPANY**

558 Iranistan Ave. • Bridgeport 5, Conn.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-276

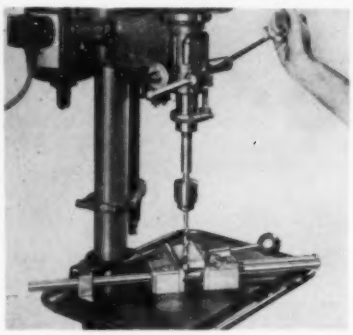

ened and ground ways are standard. The unit can be mounted in horizontal, angular or vertical positions.

The Hartford Special Machinery Co., Hartford 12, Conn. **T-3-2761**

## Work Holders

Circle-Grip, a built-in locking mechanism of Grip-Master vises and fixture locks has been incorporated into two new work holders.

No. 12WH Heinrich band saw vise can be set instantly by sliding movable



jaw into position. It has a capacity of 12½ in. Workpiece is locked securely by a light press of the locking lever. Hands are clear of saw for safe operation. Hardened and ground bar and locking mechanism insure long life. Soft, cold-rolled guide bar prevents damage to saw blades. Removable shoulder screws are provided for automatic chain feed operation.

No. 13WH Heinrich drill press vise has a capacity of 6 in. It also features the Circle-Grip locking mechanism with instant setting and secure locking advantages. Vise with table mounting attachment fits any drill press and does away with clamps, straps and adapters. Anchored firmly in position, the vise leaves operator's hands free of all moving parts and eliminates danger of unit breaking loose from table. Vise swings off table when not in use. A corner mounting attachment is also available.

Heinrich Tools, Inc., 1536 Clark St., Racine, Wis. **T-3-2762**

## Small Air Cylinders

Both single and double-acting air cylinders are now available in 1, 2, 3, and 4-in. strokes. The compactness and mounting flexibility of the Hand-Air cylinder make it well-suited for all types of clamping, parts positioning and ejecting, as well as light-duty tool and work feeding operations. Cylinders are equipped for simple, universal mounting. They may be front or side-mounted, front or rear flange-mounted, or front pivot mounted. The $\frac{5}{16}$-in. piston rod is

threaded for easy coupling to workloads. All models develop a thrust equal to the air pressure applied.

The Bellows Co., Akron 9, Ohio.
**T-3-2771**

## Electric Shear

Shearing action of high-speed electric shear provides fast, effortless cutting of any shape in metal up to 10-gage mild steel. The shear is complete with its own base and supporting column. By removing the supporting column, the shear may be used as a bench shear.

The eccentrically mounted cutter head imparts a downward forward motion to the upper blade which shears the metal rather than punching through it. This provides fast, clean cutting while insuring long blade life. Accurate

cutting to a line or template is possible. Sheet may be turned in any direction during the cut.

Powered by a 60-cycle, 120 volt a-c motor, which is direct-connected to the cutter head, the shear produces 1725 cutting strokes per minute—correct speed to handle cutting, trimming and slitting operations in any metal to the shear's capacity. The shear will slit 12-gage mild steel at the rate of 15 fpm. High carbon, high chrome upper and lower blades are adjustable for wear and may be easily removed for resharpening or replacement.

Beverly Shear Mfg. Co., 3004 W. 111th St., Chicago, Ill. **T-3-2772**

## Gear Classifier

Automatic, probe-type, gear size monitoring system has a gear gaging action based on point contact of individual probes. The unit is particularly suitable where gears go directly to the classifier before passing through a washer.

This model has a three-point contact system—two lower stationary probes and one upper "floating" probe—that senses 100 percent gear production from a single machine or a bank of machines. Both a visual and electrical check of production accuracy is provided within the specified tolerances of the gear pitch diameter.

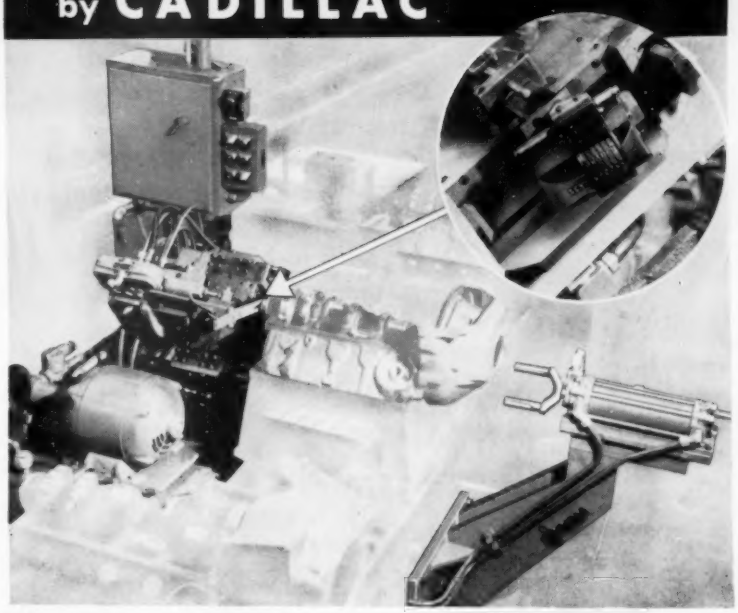
In operation, gears enter the classifier from the side and continue down the inclined ramp through the probe-sizing operation. Gears within specified tolerances continue through the classifier to the next operation. Any oversize or undersize gears are automatically shunted aside and collected separately for salvage or scrap.

Geneva-type mechanism controls and times the probe movement as well as the escapement action that feeds gears to the probing station at a predeter-


*Another Example* of an

**Automated Installation**

by CADILLAC



Shown here is an AUTOMATED MARKING installation engineered and built by Cadillac. It is in service on one of the most modern automated engine assembly lines in the automobile industry. The insert shows automatic numbering head (barrel style).

**As engines reach this station, the Cadillac Machine roll stamps serial numbers and simultaneously records the numbers on tape . . . complete time cycle, 7 seconds.**

See **OTHER** Cadillac Marking Machines in operation at ASTE Show, **Booth No. 212.**

**CADILLAC STAMP CO.**
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mined rate. It also locates the gear properly in relation to the upper and lower reference probes. A low-speed, gear motor drives the mechanism.

Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. **T-3-2781**

## All-Position Electrode

All-position E-6013 electrode, Fleetweld 37, for a-c or d-c current is designed especially for ease of operation. Its features are particularly useful either in welding sheet metal where burn-through, sticking and poor fit-up may be problems; or when using low open-circuit voltage welding machines; or for steel plate fabricating where an all-position, easy operating electrode is desired.

The arc is steady, even when used with welding machines having an open circuit voltage as low as 44 volts. This permits using the electrode with small transformer-type welders. The excellent arc characteristics also reduce electrode sticking tendency, sometimes encountered with this type electrode when welding on the low side of a machine's current operating range.

In addition to being stable, the arc is soft and smooth and easy to handle. A drag technique may be used. Slag characteristics make for quick removal, good bead appearance and simplify vertical up-welding. The soft arc handles poor fit-up well, and makes clean edge and corner welds. It also minimizes the tendency to burn-through when welding thin gage metals. The electrode is available in $\frac{1}{8}$, $\frac{5}{32}$ and $\frac{3}{16}$-in. sizes.

The Lincoln Electric Co., Cleveland 17, Ohio. **T-3-2782**

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Outstanding Values
Standard Steel gage blocks at prices which any shop can afford. Top quality. Typical Webber values.
84 Block Set
Standard Steel with
← Accessories
A complete gaging system—at a low price. The accessories included enable a complete variety of applications; such as scribers, height gages, snap gages, plug gages—all have the famous Webber accuracy.
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Most durable, and economical gage blocks. Diamond hard—Croblox remain accurate year after year, reduce production costs. Corrosion resistant.
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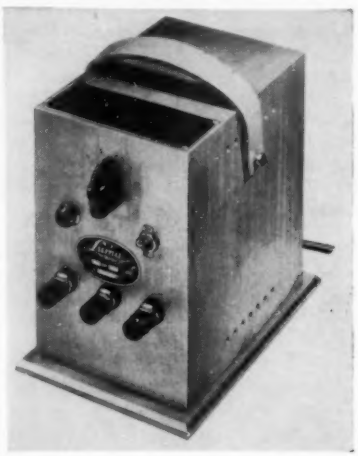
## Resistance Soldering

Six-stage selector switch used in conjunction with three secondary terminals provides 18 heat stages or 18 different voltages from 1.3 to 5.1. This soldering tool No. 626 operates on 115 volt 60 cycle with a wide range of power (5 to 1800 watts) and performs most efficiently and economically when used with



carbon electrodes under $\frac{3}{8}$-in. diameter. It has been designed to handle numerous soldering jobs from fine precision work to medium heavy industrial operations with over 16 styles of holders to choose from. It quickly supplies concentrated heat at the exact area to be soldered.

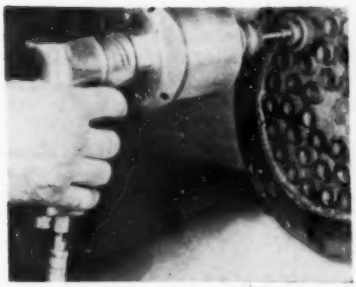
The Luma Electric Equipment Co., Toledo, Ohio. **T-3-2783**

## Portable Tube Expander

Tube expander drive, called Torq-Air-Matic, offers a control free from the effect of operating variables and maintenance problems. Torque output of this control is calibrated in terms of pound-feet instead of arbitrary units of measurement.

This method of registering torque at the output spindle prevents tubes from being over-rolled or under-rolled. Warp-

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-278

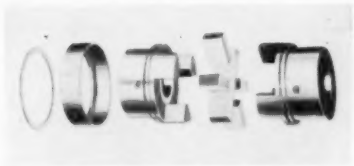


age and ligament "push-over" are reduced, while tube bowing is minimized.

The unit is an all-air rotating type control. It will produce 14 lb-ft torque at 90 psi with maximum consumption of 12 cfm of air. It is completely self-contained, which eliminates the need of separate control cabinets, cables and other connections. The only connection required is the operating air hose.

Thomas C. Wilson, Inc., Long Island City, N.Y. **T-3-2791**

## Flexible Coupling



Radially removable flexible coupling provides extremely easy assembly and disassembly. The unit is lubrication-free and is especially suited to centrifugal and impeller pumps and other installations where radial removability is required.

Six sizes are available, ranging from 2.58 to 29.6-hp at 100 rpm. All feature reversible cushions so that the cushions can be reversed on unidirectional loads to double their service life. The radial removability is accomplished by special cushions cut so they are held in position by a standard type C-collar when the coupling is assembled. When the collar is removed the cushions can be easily removed. This allows the coupling half and connected shaft to be rotated so that the intermeshing jaws slide into the stationary coupling half which is not removed.

Lovejoy Flexible Coupling Co., 4998 W. Lake St., Chicago 44, Ill. **T-3-2792**

## Contour Wheel Dresser

Developed for use on centerless grinders and designed to replace the form bar type dresser on Cincinnati No. 2 centerless grinders, this contour wheel dresser can also be adapted to other centerless grinders. It can dress any profile on the grinding wheel into which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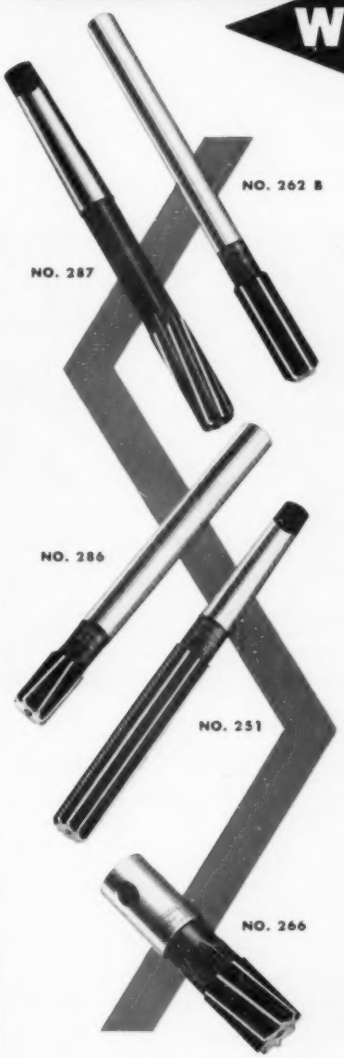


To assure you of increased production . . . smooth chatter-free cutting action . . . more reamed holes per grind . . . longer reamer life . . . holes that are extremely accurate and having finest finishes . . . your local W & B distributor stocks a complete line of high speed reamers.

In the complete W & B line you will find reamers of every type. Each type is designed from years of experience to provide you with highest efficiency reaming on specific jobs. "There's A Big Difference In High Speed Reamers" . . . Look to W & B for that difference!

Call your W & B distributor for quick delivery of in-stock reamers that will best meet your needs. For reamer literature or additional information, write direct.

NO. 262 B . . .
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NO. 287 . . .
Hercules Taper Shank Chucking Reamers.
NO. 286 . . .
Hercules Straight Shank "Altercut" Chucking Reamers.
NO. 251 . . .
Hercules Taper Shank Jobbers' Reamers.
NO. 266 . . .
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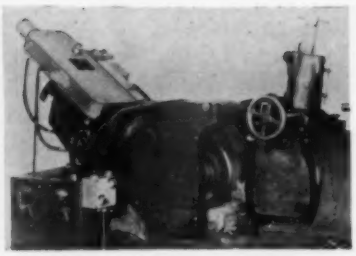


the diamond can enter, including perpendicular shoulders which normally cannot be dressed with automatic equipment. The dresser is equipped with automatic downfeed.

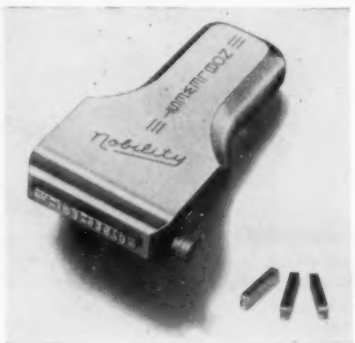
Dressing cycle is controlled by a single moving slide carrying two enlarged cams inside the housing; one for controlling the movement of the diamond across the grinding wheel, and one for controlling the movement of the diamond in and out of the wheel. The ratio of these cams to the profile on the grinding wheel may be as high as 20:1 for narrow profiles and can easily be changed in a few minutes to a different ratio for a wider profile. Dressing speed is controlled so that the diamond will travel at a constant peripheral speed.

The dresser can be used for contours where acuracy 0.0002 in. or better is required. It can be cycled so the dressing is fully automatic, with compensating devices for sizing the part. All bearings and slides are hardened, ground and lapped high-alloy steel for long wear and accuracy. All slides are of the ball-bearing type.

Hoglund Engineering and Mfg. Co., Inc., Berkeley Heights, N. J. **T-3-2801**

## Steel Type Holder

Hand type holders accommodate interchangeable steel type for random setups of part numbers, heat codes, date codes, etc., for the hand stamping of castings, forgings and machine parts. The holder is used whenever parts are too big or cumbersome to bring to a marking machine or marking press or when production quantities do not warrant a machine operation. The holder is a decided improvement over individual letter and figure stamps in that the entire impression can be made with one hammer blow.




Made of alloy steel, the frame is heat treated for long life and the elimination of spawling. Type slots are precision machined for type alignment and squareness. The holder is equipped with a removable, hardened seat and an oversize socket-head cap screw which clamps the type firmly in place. Holders are available for $\frac{1}{16}$, $\frac{3}{32}$, $\frac{1}{8}$, $\frac{3}{16}$ and $\frac{1}{4}$ in. size type.

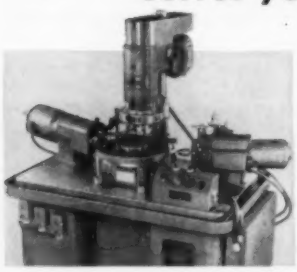
Noble & Westbrook Mfg. Co., East Hartford, Conn. **T-3-2802**

## Rolling Mills

Line of precision rolling mills is built in a wide range of sizes and types for rolling ferrous and nonferrous materials. Sizes range from small jewelry type two-high mills to large two-high and four-high mills for high production rolling of materials up to 12 in. wide.

Sturdy in design, and engineered for extreme accuracy, the mills are used for

NEW ETTCO'S Tapping and Drilling Twins ...the versatile combination that solves your small hole problems



A high-production, special purpose combination drilling-tapping machine built entirely from standard Ettco units and components.

NOW—two separate self-contained, built-for-the-purpose units that meet most single or multiple drilling and tapping requirements.

Both units have been designed for extra power, speed and rigidity to insure greater precision at high production rates.

Ettco's Tapping and Drilling Twins are available as individual units or as standard upright machines. They can also be built into automatic drilling and tapping machines simply by mounting them in any desired combination on a standard base. *Write for details—today.*

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the right equipment for every small hole drilling and tapping need.

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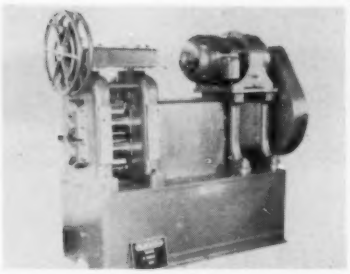


hot and cold rolling of strip, sheet, rod and wire as well as for wire flattening, embossing, and forming.

H. J. Ruesch Machine Co., 407 Mulberry St., Newark, N. J. **T-3-2811**

## Gear Reducer

Five-speed gear reduction unit is designed so that speeds can be changed quickly and easily while the unit is running. The unit has the following gear reductions: 2½, 5 10, 25 and 50 to 1. To eliminate the cost of a clutch and dismounting the unit for special setup there is a neutral station.

Housing is cast aluminum; shafts and precision gears are 416 S.S. Input and

output shafts are both mounted in ball bearings. For servo and central applications, over-all height is 3 in., over-all length 3⅞ in. Base is designed with T-slots and captive nuts to simplify mounting and meshing the output gear with the drive unit.

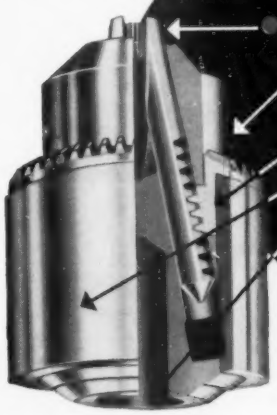
Haxton Gear Co., 7-11 Main St., E. Rockaway, L. I., N. Y. **T-3-2812**

## Submersible Cable Connectors

Designed to withstand the most adverse conditions of temperature, corrosion and water submersion, these all-weather heavy-duty submersible plugs, receptacles and cable connectors, known as the W series, are available in 3 to 60 pole combinations.

With housings constructed of highly corrosive-resistant brass, thick enough to absorb abnormal abuse without cracking, the fittings are tested against leakage under water at 20 psi. All rub-


Here are the points...


Jaws Nickel Chrome Moly Alloy Steel
Key Holes: do not extend into body cavity thereby sealing out dirt
One Piece Geared Nut Construction
Entire Chuck Body Hardened inside and out
Taper Bore hardened and ground
Chucks and Keys interchangeable with other makes

...that make

Quality Supreme BRAND Chucks

Every chuck is individually checked for accuracy . . . you can depend on Supreme Chucks for trouble-free performance and long wear.

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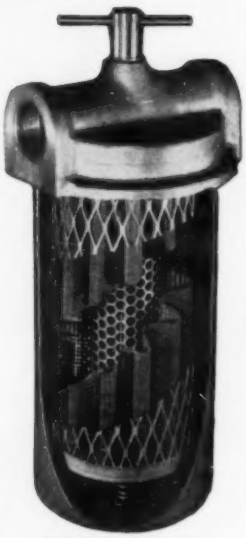
# For Dependable Protection On Hydraulic Equipment

SUMP TYPE (Cutaway)

## MARVEL SYNCLINAL FILTERS

**Over 650 Original Equipment Manufacturers Install Marvel Synclinal Filters as Standard Equipment.**



LINE TYPE (Cutaway)

**Hydraulic Oils MUST BE CLEAN to Protect Equipment— Increase Production— Reduce Maintenance**

PRODUCTION ENGINEERS and MAINTENANCE MEN, whose job it is to keep production machinery operating at peak efficiency, are specifying Marvel Synclinal Filters on new equipment and standardizing with Marvels throughout their plants.

### It's The ACTIVE Filtering Area That Counts!

The Synclinal design of Marvel Filters provides that all-important balance between maximum ACTIVE filtering area and sufficient storage capacity for filtered out particles. Thus, longer periods of productive operation are attained before filter cleaning is necessary. Marvel Synclinal Filters are easy to clean because both the sump and line type may be disassembled, thoroughly cleaned and reassembled in a matter of minutes. Line type operates in any position and may be serviced without disturbing pipe connections.

### A SIZE FOR EVERY NEED

Available for sump or line installation in capacities from 5 to 100 G.P.M. Greater capacities may be attained by multiple installation (as described in catalog). Choice of monel mesh sizes range from coarse 30 to fine 200.

### FILTERS FOR FIRE-RESISTANT HYDRAULIC FLUIDS

Marvel's most recent development is a filter for the efficient filtration of all types of Fire-resistant hydraulic fluids.

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### WATER FILTERS

Both sump and line type filters have been adapted for use in all water filtering applications. No changes have been made in the basic, balanced synclinal design.

Catalogs containing complete data available on request

### IMMEDIATE DELIVERY!

As in the past, Marvel continues to offer IMMEDIATE DELIVERY.

**MARVEL ENGINEERING CO.**

**7227 N. Hamlin Ave., Chicago 45, Ill. Phone: Juniper 8-6023**

Without obligation, please send me complete data on Marvel Synclinal Filters, as follows:—

- ☐ Catalog #107—For Hydraulic Oils, Coolants and Lubricants
- ☐ Catalog #301—For WATER
- ☐ Catalog #200—For Fire-resistant hydraulic fluids

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Title .....
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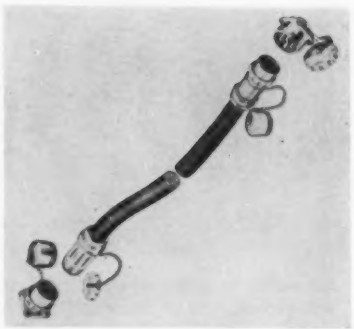
City .....
State .....

TE-3

ber parts are oil resistant and will function properly at —40 F. All contacts are tin plated for added corrosion resistance and wearability and when mated units are coupled, double gasketing assures a complete water seal.

Thread caps attached to chain maintain complete water-tight features when units are uncoupled. The units are suitable for use with power, lighting and control circuits and coaxial types are available for audio, radio, video and automation circuits.

Pyle-National Co., 1334 N. Kostner Ave., Chicago 51, Ill. **T-3-2821**

## Marking Stamps

Four styles of etching stamps, made from acid-resisting molded plastic, are useful for identification and inspection marking. The four styles of stamps are: Peg style, for most general use, in which the plastic stamp is mounted on a rectangular or round wooden peg;

Dowel type, similar to the peg style with the addition of a special cap and self-contained ink pad, which fits on the stamping end; Key-chain dowel style, also with a cap and self-contained ink pad, but for affixing to a key-chain; and the Pocket-clip style, all-metal with a cap and ink-pad, and with a pocket-clip to enable the user to carry it on the person like a fountain pen.

Acid-etch inspection and identification marking finds great use where the part to be marked is of a delicate nature or is made from a delicate material; or where the part is odd-shaped, making it difficult to mark with conven-

tional methods. Nearly all metallic products can be acid-etch marked, and all marks are tamper-proof, as the mark can be removed only if the surface is removed.

Jas. H. Matthews & Co., 3923 Forbes St., Pittsburgh 13, Pa. **T-3-2831**

## Portable Drafting Machine

Portable drafting system of professional quality called Desk-Topper, features a personal size professional drafting machine, complete with folding drawing board, accurate metal scales, instrument box and carrying carton.

The unit sets up or puts away in two minutes' time—with all drawing tools immediately at hand, providing a drawing capacity of 22 x 34 in., while the folding drawing board accommodates designs up to 17 x 22 in. Desk-Topper has the precise features of a full-size drafting machine, including 360-deg protractor, automatic 15-deg indexing and full baseline selector. A range of scale graduations is available for varied needs, including elite and pica typewriter spacing for business forms and office work, as well as scales for blueprints, design and engineering.

The Universal Drafting Machine Corp., 7960 Lorain Ave., Cleveland 2, Ohio. **T-3-2832**

## Automatic Bar Feeder

This bar feeder handles random lengths of tubing and bar stock automatically, feeding the entire stock load to the machine without any attention from the operator. Remnants of each bar or tube are automatically ejected and the end of each new bar is automatically trimmed and chamfered.

The feeder has a hopper for use with lighter wall tubing. It holds about 100 pieces of 2¾-in. OD or equal bulk of other sizes. There is ample room for chain removal when crane loading is desired. An inclined table is used for bar stock or heavy tubing. Where both light wall tubing and heavy bars are used, the feeder may be equipped with both hopper and inclined table.

For small diameters and light wall turbine a V-trough is used. For large stock there are rollers on which the stock rotates while cutting off, and lifting rollers for the stock while being fed through the spindle.

Feeders are available for any maximum length bars, and in sizes to fit every model of the Modern cutting-off machine. Simplified feeders for a single diameter stock can be furnished.

Modern Machine Tool Co., 2005 Losey Ave., Jackson, Mich. **T-3-2833**

## Heavy-Duty Cylinders

New line of nonrotating, double-acting, square-end cylinders is identified as Logan Ultra-mation cylinders. Basic specifications are as follows: five bore


*For...*

*General-Purpose Sawing*

**with**

***High Speed***

***Accuracy, Economy***

Model 4B/M2/E2
Equipped with standard work track
(Optional Equipment).

Let us prove to you the many reasons why this MARVEL Hack Saw offers the cheapest, most accurate and fastest "cut-off" method available to you at a low initial cost.

Ask your dealer, or write us for Bulletin GP35 which fully describes and illustrates the many exclusive features which makes this Hack Saw Machine your "best buy".

**MARVEL No. 4B**

**HIGH SPEED HACK SAW**

*Exclusive features*

1. Horizontal Ball Bearing Saw Frame.
2. Screw Feed—Automatic or Hand Driven.
3. Quick Return Stroke—allows greater number of strokes per minute.
4. Simple Positive Coolant System.
5. Adjustable Stroke—can be shortened for larger capacity.
6. Speed Range—available in 1, 2 or 4 speed models for wider range of work.

MARVEL Metal Cutting SAWS
Better Machines—Better Blades

ARMSTRONG-BLUM MFG. CO. • 5700 Bloomingdale Avenue • CHICAGO 39, ILL.

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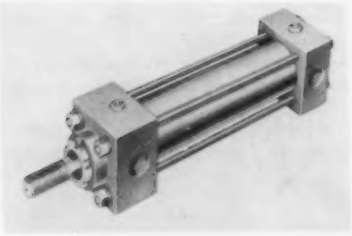


sizes from 2 to 6 in.; pressures to 150 psi air to 500 psi oil; five basic mounting styles—foot, trunnion, flange, clevis, pivot—with interchangeable covers permitting multiple mounting combination; covers, both front and blind end are heavy steel plate; piston rods are extra-heavy to carry high-impact loads and have highly polished surfaces to assure minimum friction and maximum packing life; rod wipers are synthetic rubber, assuring dirt-free rod on in-stroke; cylinder tubes are hard-drawn and corrosion-resistant for low friction; pistons are high-quality steel; ports are adequate size, unobstructed, and can be relocated to any 90-deg position by rotating cylinder covers; tie rods are extra-heavy to resist shock loads and to maintain proper tension on cover gaskets. Cushioning is available for either or both cylinder ends as specified. Cushioned or noncushioned cylinders have same mounting dimensions.

Logansport Machine Co., Logansport, Ind. **T-3-2841**

## Self-Propelled Electric Motor Wheel

Self-propelled electric motor wheel combines an electric motor within a wheel to make a compact and integral driving unit. The motor is designed so there are no transmissions, driving shafts or differentials required to turn wheels and rotating parts. Consequently, there is considerable saving of space and weight, and reduced operating costs.

It is easily installed and can be fastened to almost any type of wheel or rotating part. The motor runs on a-c or d-c current from either generator or battery. In the illustration the motor wheel is used as a portable electric capstan.

This motor design provides increased delivery of power per given input of energy directly to the wheel or rotating part, since it occupies the unused space between the hub and the wheel rim with minimum friction loss. Both armature and field counter-rotate, providing considerably greater gear horsepower output than ordinarily produced.

Management Directions Inc., 8681 Wilshire Blvd., Beverly Hills, Calif. **T-3-2842**

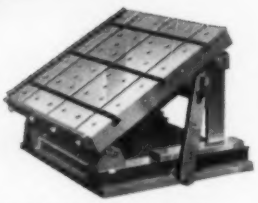
## Vapor Degreaser

Vibrating conveyor type of vapor-degreasing machine moves small parts and chips in a circular uphill action, passing parts through a liquid immersion, liquid rinse, and solvent vapor zone.

Degreasing action is made possible by a combinatoin of flexible, vibrating leaf springs and electromagnets to which a


**Robbins ...THE COMPLETE LINE OF ANGULAR TOOLING EQUIPMENT**

Save dollars in valuable tool room time on every job! Set-ups that require hours by other methods take minutes the Robbins way. Just four simple steps: (1) Look up required angle in Table of Constants furnished with each tool, (2) Select gage blocks from the Table, (3) Place gage blocks between base of unit and sine bar swivel block, (4) Secure the work . . . and you're ready to go! Complete range of models and sizes brings Robbins precision equipment within the reach of every shop, large or small.

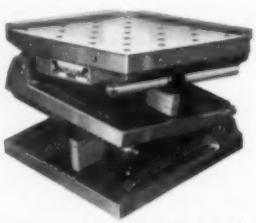


**HEAVY DUTY SINE PLATES FOR MILLING AND BORING**

Fool proof! Rugged enough to take thrust and chatter of heavy cuts . . . yet built to tool room accuracy for the most exacting inspection operations.

**"MAGNA-SINE" MAGNETIC TABLES FOR PRECISION GRINDING**

Set up and grind any single or compound angle fast! Work is held securely by magnetic attraction, clamped or released in an instant. Work can't warp or move.



**INSPECTION SINE PLATE FOR EVERY INSPECTION OPERATION**

Eliminate chance of errors in inspection department and tool room! No more V-blocks, angle plates, or complicated built-up sets of blocks. Simple, fast and sure.

*Write or call for complete information now!*

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**24800 PLYMOUTH ROAD DEPT. E DETROIT 39, MICH.**

*Also producers of special machinery, gages and fixtures*

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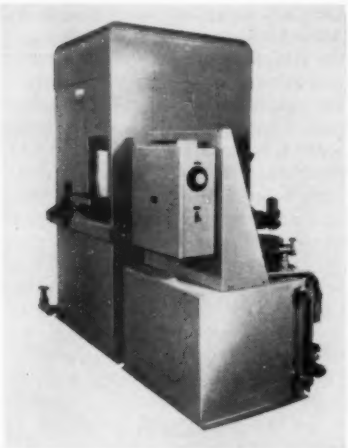
spiral trough is attached. This assembly is energized by a pulsating current creating the vibration that transports the work through the cleaning cycle to the unload chute.



Capable of cleaning up to 3,000 lb of chips or metal parts per hour, the unit requires floor space of no more than 5 x 5 ft. Accurate automatic controls eliminate all necessity of manual operation. Further, this unit can be fed by one conveyor and be synchronized by a selector switch to discharge to another conveyor. Also, it can be operated as a batch-type unit.

Loading and unloading chutes can be positioned to work from any side of the machine as may be required in a particular operation. The unit is completely enclosed except for the small openings where parts are loaded and unloaded. It is of heavy-duty, all steel, welded construction. Shipping weight is approximately 4500 lb. The solvent capacity of this unit is 85 gallons.

Manufacturers Processing Co., 1360 Hilton Rd., Detroit 20, Mich. **T-3-2851**

## Lockings Inserts

Screw-lock inserts eliminate lock washers, lock nuts and locking wires. They also provide strong, permanent, wear-resistant threads in light metals, plastics, steel and cast iron.

Known as Mid-grip inserts, they are companion products to the Heli-Coil wire screw thread inserts. Both are


★ No Glaze?

NOT WITH CLIPPER DIAMOND TOOL CO.'s NEW CERAMET BONDED DIAMOND WHEELS

★ SOMETHING THAT WETS DIAMONDS?
Right! CERAMET* is a ceramic-vitreous bond that actually *adheres* to the diamond!

★ UNIQUE BOND ADHESION?
Right! You can't KNOCK diamond grains out—you'll have to WEAR THEM DOWN.

★ PROGRESSIVE "BREAKAWAY" ACTION?
Right! As diamond grains wear flat, CERAMET* progressively releases them, exposing new, sharp grains. Your grinding surface is ALWAYS CLEAN AND NEW.

★ NO GLAZING OR CLOGGING?
Not even when you grind carbide and steel TOGETHER!

★ LONGER LIFE? LESS DRESSING? LOWER COSTS?
Right! Right! Right!

★ ASK us for full details.

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CLIPPER manufactures a complete line of—

DIAMOND TOOLS
dressing
turning
boring
impregnated
radius forming

DIAMOND WHEELS
resin bonded
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CLUSTER TYPE WHEEL DRESSER

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CLIPPER DIAMOND TOOL CO., INC.
21A WEST 46th STREET, NEW YORK 36, N. Y.
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Look to

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for a complete line of fixture details

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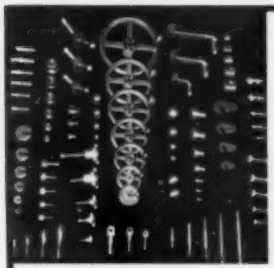
The jig and fixture components pictured below are just a part of the Monroe line.

EACH money-saving detail is engineered by and for tool engineers. Monroe Engineering Products, Inc., offers the most complete line of jig and fixture components ever assembled in one catalog.

This fully illustrated Catalog offers you accurate full size templates of assemblies.



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Engineering Products, Inc.
Monroe Michigan

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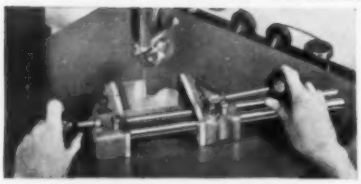
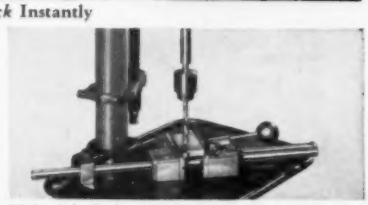
NEW HEINRICH WORK HOLDERS

Set ...IN A FLASH!

*Set* and *Lock* Instantly



Heinrich Band Saw Vise. Capacity, 12½". Hands are clear for *safe* operation.



Heinrich Safety Drill Vise. Capacity, 6". Fits any style drill press.

New HEINRICH Grip-Master Work Holders set and lock instantly. Band Saw Vise has removable shoulder screws for automatic chain feed operation. Safety Drill Vise with table mounting attachment leaves operator's hands free . . . safely secures vise . . . eliminates danger of unit spinning or breaking loose.

*Write for FREE Catalog*

"Circle-Grip" locking mechanism used in Grip-Master Vises is also used in HEINRICH Work Holders.

See us at the ASTE Show—Booth No. 788

**HEINRICH TOOLS, Inc., Dept. 186-C Racine, Wis.**

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-286-2

made of precision-formed stainless steel, provide 60-deg threads, and are installed with similar tools.

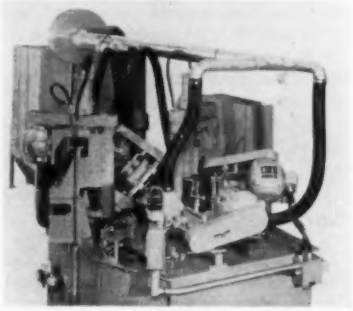
The insert exerts a strong locking effect on a screw fastener because one or two coils in the middle of the insert are generally octagonal instead of round. As the screw passes through this area, the gripping coils are forced to assume a circular shape, giving the locking effect which is not diminished through many cycles of disassembly. The locked screw may readily be freed by applying break-away torque approximately the same as used in the original assembly. It is not necessary to seat the gripping coils with a special tool.

The new inserts provide internal threads so wear-resistant they permit the substitution of ordinary cap screws for studs, which require extremely careful tapping and interference-fits. They are available in sizes 10-32, ¼-28, 5/16-24, ⅜-24, with other sizes in NC and NF series through ½ inch scheduled for availability shortly.

Heli-Coil Corp., Danbury, Conn. **T-3-2861**

## Deburring Machine

Deburring machine designed for automatic production lines deburrs 200 multislitted, broached parts in one hour. An operator places the gear or part on an expanding collet which holds it in place while it moves around an automatic indexing table. The part travels through five brushing stations and is indexed into four different positions.



Brushes can be adjusted to compensate for wear by turning handwheels on each brush station individually. In dry brushing, the metal particles are drawn off by a vacuum system, using hoods about the brushes to carry off the chips.

Fuller Brush Co., Machine Div., Hartford 2, Conn. **T-3-2862**

## Grinding Fluid

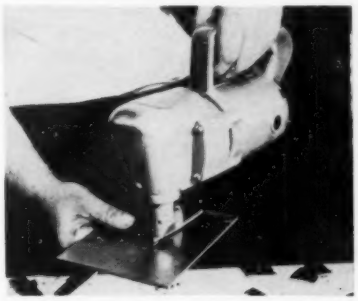
New grinding compound, Cimplus, is a water soluble, transparent concentrate that gives exceptional rust control at dilutions between 1:100 and 1:200.

Though used primarily as a transparent grinding fluid, it can also be used to advantage when machining cast iron. Also, it can be used in Cimcool mixtures for the added rust control needed in hard water areas.

Cincinnati Milling Machine Co., Cincinnati 9, Ohio. **T-3-2871**

## Portable Nibbler

Designated Model HN, this heavy-duty nibbler handles stainless steel of all types up to 10 gage; milder steels and nonferrous metals to 8 gage.



Features of the tool are portability, maneuverability, and ability to cut cleanly, without distortion of metal or excessive burring. The nibbler will follow patterns or templates and will cut from any angle. It will also cut contoured or corrugated stock. Minimum cutting radius is 6 in.

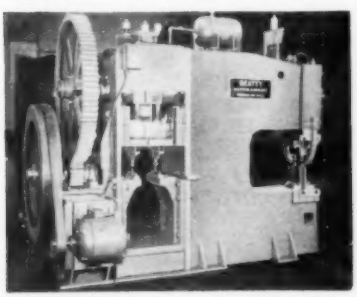
Speed at full load is 600 strokes per minute, taking ¼-in. slugs with each stroke. Motor is universal type, approximately 1 hp. Punch and die are removable and may be resharpened or replaced as necessary.

Fenway Machine Co., Edgemont and Clementine Sts., Philadelphia 34, Pa. **T-3-2872**

## Special Punch for I-Beams

Detail beam punch facilitates single-hole punching. This machine, designed as the No. 7 Detail Beam Punch, will accomplish the punching of I-beams in three passes instead of five and also eliminates the end-for-end turning of beams.

The punch is of 100-ton capacity, mechanically driven, open-throat and guillotine type, and will punch up to a 1¼-in. hole through 1-in. material. Mounted in the open throat portion of the machine are high dies available for punching webs of beams, angles, channels and flat plates.



Guillotine portion of the machine is provided with two overhanging bolsters with punch tools for punching holes in flanges on either side of the webs of beams. Flange punch tools are arranged so that when moved to small ends of bolsters, small beams can be punched while heavier beams are punched with tools moved back on bolsters.

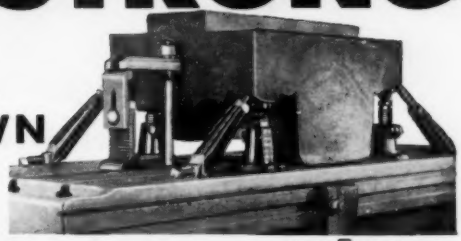
Beatty Machine & Mfg. Co., Hammond, Ind. **T-3-2873**

## Heat Distortion Tester

Five specimens, regardless of differences or similarity, can be tested at the same time by a new 5-gang heat distortion tester. Complete within itself, each of the 5 units includes an automatic deformation indicator, thermometer, pilot light, automatic heating controls


ARMSTRONG

SET-UP *and* HOLD-DOWN TOOLS



PLANER JACKS

NON-SKID JACKS

STEP BLOCK

ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down Tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

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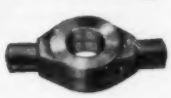
UNIVERSAL CLAMP

T-SLOT BOLTS AND NUTS



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Standard 12 stop Intermittor with specially jig-bored 36" dial.

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## CAN YOUR PRESENT MACHINERY PRODUCE 30,000 PIECES AN HOUR?

Few production machines can . . . but it's possible with the Ferguson Intermittor Index Table. There are models capable of 30,000 indexes an hour if your machinery and tooling can keep up with them. The point is *. . . the Intermittor does not limit the speed of your machinery the way geneva driven or air or hydraulic operated tables do.*

Perhaps speed is not your problem, but excessive maintenance costs are . . . resulting from the clanging, banging and jarring you get from a geneva drive. Here again you find the solution in an Intermittor. Employing modified trapizoid acceleration characteristics, the Intermittor has an initial acceleration point of zero with a gradual increase to the maximum and an equally gradual decrease to zero again . . . *all of which means that the Intermittor is a smooth operating table with minimum shock and vibration.*

Or maybe you like accuracy . . . but don't like shot pins. The Intermittor Indexing mechanism has an accuracy of .001" with zero backlash — *and no shot pins!*

There are many more reasons why you should install an Intermittor when you need a rotary table for large volume production, including the fact that you can select one of 150 standard models from a catalog and get exactly what you need in terms of dial size, number of stations and indexing period.

**OVER 150 STANDARD MODELS TO CHOOSE FROM:**

Standard 24 station Intermittor with 30" dial and optional stationary tooling plate above the dial.

6 station Intermittor with 12" dial and special tool mounting brackets.

Standard 18 station Intermittor with 48" dial.

**Send for our Catalog No. 300 . . . it has a definite place in your file if you have the responsibility of speeding up production or converting to automation.**

ferguson

**FERGUSON MACHINE & TOOL CO., INC.**

ROLLER GEAR DIVISION, DEPT. TI-3, P. O. BOX 5841, ST. LOUIS 21, MO.

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and a cooling system which speeds the testing process. Temperature increases from 25 C to 2 C per minute can be obtained through use of automatic heating controls.

Each unit of this tester will accommodate speciments from ⅛ by ½ to ½ by ⅛ in. Fiber stress of 66 psi or 264 psi may be applied to the samples which are subjected to center loading transverse stress.

Greater convenience in testing is accomplished as individual units have been so designed that each can be easily removed or replaced. By releasing a spring clip and lifting, specimens can be readily inserted in the test unit.

Tinius Olsen Testing Machine Co., 5230 Easton Rd., Willow Grove, Pa. **T-3-2881**

## Noise Attenuator

Improved noise protection and increased operating comfort are important benefits obtained with the new 4-44 series Atomuffler. The unit features a number of significant developments such as an internal resonator, a new air diffuser having a large exhaust radiation area.

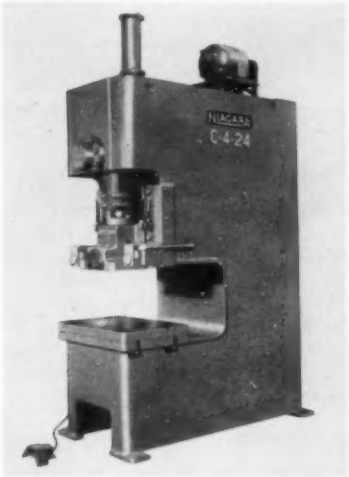
The pneumatic noise attenuator when connected to the exhaust port of air-operated equipment eliminates 99.9 percent of the objectionable exhaust noise of air-operated equipment. Another design improvement is a stronger, more durable construction, built to give better service and longer trouble-free performance. The new compact model is easy to install and is available in eight pipe sizes ranging from ⅛ to 2 in. NPT.

Allied Witan Co., P. O. Box 2770, Cleveland 11, Ohio. **T-3-2882**

## Deep-Throat Presses

Featuring a revolutionary crankshaft design, a new line of deep-throat presses is built in eight different models from

22 to 150-ton capacities, each with several throat depths. They are designed to perform a great variety of blanking, forming, drawing, perforating, combination die and automatic feeding operations in short change-over runs or high-production setups.




The front-to-back crankshaft permits not only space-saving enclosed construction, but also the use of a wider slide and longer gibbing to provide greater support for wide dies and off-center loading. In the new design, the entire driving mechanism is concealed within the limits of the compact, all-steel frame. Gear and clutch members operate in sealed baths of oil to assure longer service life. With all gearing enclosed within the press frame, overhung bearings are eliminated and the more rigid support thus provided greatly minimizes shaft deflection.

The heavy-duty steel frame is box type, with a heavy crown, deep bed and a solid bridge between the gibs forming a rigid tie between the uprights. These welded units, stress-relieved and grit-blasted before machining, are designed for maximum rigidity to provide the utmost in accuracy and longer die life.

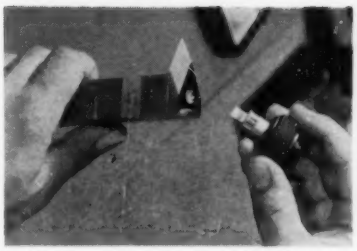
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, N. Y.

**T-3-2891**

## Torque Screwdriver for Gage Block Assemblies

Under most existing systems for assembling square gage blocks into working gages, tie rods are passed through the holes in the center of the blocks and the stack is clamped by screws which fit internal threads at each end of the tie rods. Tightening the screws with an ordinary screwdriver has led to inconsistency in dimension since the ultimate clamping pressure is dependent upon the unreliable element of "feel."

The torque screwdriver for square block assemblies "slips" at a fixed torque. When used to tighten tie rod screws in a stack of square gage blocks it develops a pressure which has been established by laboratory test as sufficient to maintain a rigid assembly of wrung blocks but is, at the same time, not great enough to cause distortion. Because direct clamping pressure sufficient to wring the blocks would result in distortion, the torque screwdriver is intended for use after the blocks have been cleaned and wrung by hand in the accepted manner. This procedure of assembling the blocks, plus the use of

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- **Permanently sealed bearings . . . never needs lubrication in air lines or grinder.**
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Here's power—SUSTAINED POWER—like you've never experienced before in an air grinder . . . power unexceeded by any other air grinder in the same price range . . . **maintains its high-speed efficiency under load!** Built with a lightweight, contoured, hand-fitting aluminum housing, the Haskins **haskAIR** Grinder handles easily, balances perfectly . . . excellent for the most precise grinding job. Complete kit includes: carrying case, adapter hose, mounted points, dressing stone and wrenches.

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Chicago 12, Illinois

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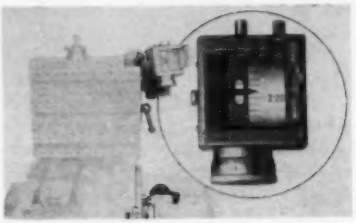
the torque screwdriver, makes it possible to achieve consistent repeat accuracy in assembling and reassembling stacks of the same dimension.

The DoAll Co., Des Plaines, Ill. **T-3-2901**

## Optical Scales

Machine tool scales and projectors are useful wherever it is necessary to manually position work quickly, yet reliably and accurately. The Hilger & Watts units illustrated provide direct readings to 0.0001 inch. Precision scales



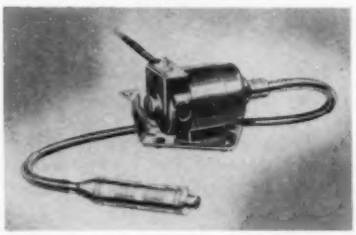
are in solid mounts and fully enclosed so that they are unaffected by coolant, dust, chips or fumes. The projection screens themselves, with their micrometers, are well out of the way of the workpiece, yet readily visible to the operator.

For quick positioning, it is only required to set the optical micrometer to the correct thousandths and ten thousandths of inch and to then manually position the slide until the proper graduation appears in the screen. As the scale is figured every 0.05 in., at least two figures are always seen and mistakes are practically impossible.

Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill. **T-3-2902**

## Flexible-Shaft Tool

High-speed flexible-shaft tool, the Super-Flex, is designed for all types of production, bench finishing, deburring, tool and die grinding, sharpening, etc. Driven by a ¼-hp universal motor that develops 22,000 rpm the tool has the power to maintain a sustained torque under load which is an ideal condition for carbide burr use.



Sheath for shaft consists of three layers—armored wire casing, wire braid and neoprene cover. It operates smoothly when bent to as small as a 6-in. radius. Around the spun wire shaft is a bronze liner that acts as a bearing to confine rotation within a confined radius. It also lubricates the shaft. A threaded adaptor spun to the sheath locks both to the handpiece. The freely rotating adaptor prevents kinking and entangling of sheath eliminating constant adjustment of work and position by the operator.

Handpiece is 6¾ in. long and weighs 14 oz. It takes ¼ and ⅛ in. shank mounted wheels and points and carbide burrs up to ⅜ in. in diameter by using rubber-flex collets. Class 7 super precision bearings are used. Handpiece is cool operating and easy to use.

Dumore Co., Racine, Wis. **T-3-2903**

## Surface Thermometer

Spot check surface thermometer, made entirely of stainless steel, has a range of from 50 to 1000 F. It is easy to read—compact and fast operating. Within 60 seconds the thermometer will reach stability and exact temperature can be easily read. Temperatures of all surfaces, such as dies, hot plates, heavy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This rugged and dependable electro-magnetic power unit has been developed to make difficult and costly drilling, tapping, and reaming operations simple and economical.

Its heavy duty electro-magnetic base makes it possible to affix power drill right to the surface of a job. For operating accuracy, regardless of working position, the burden of weight is completely spared the operator.

Special features of this unique power tool include: an electro-magnetic power control switch for easy operation, heavy duty power capacity for positive positioning, de-magnetizing switch for immediate removal from work, and an optional reversing switch for tapping operations.

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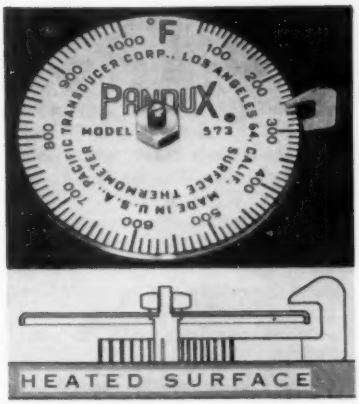


sheet metal, furnace skins, boilers, large super-heated steam pipes; cooled billets, etc., can be read accurately. It also reads ambient temperatures in furnaces, ovens and other enclosed spaces; as well as in noncorrosive liquids and gases, up to 1000 F. It is calibrated to within plus or minus 2 percent. The diameter is 1¾ in. overall, and the weight is ⅛ oz.

Pacific Transducer Corp., 11836 W. Pico Blvd., Los Angeles 64, Calif.

**T-3-2911**

## Deviation Test Bridge

New deviation test bridges give extremely fast direct-reading impedance comparisons. The instruments are used primarily for production inspection, inspection of resistance, capacitance and inductance. They are designed to accurately and quickly present a comparison against a standard impedance indicating both percentage impedance deviation and phase-angle deviation in radians on a 6-in. illustrated scale.

Wherever repetitive bridge type measurements are required, these bridges cut measuring time to a minimum. Interchangeable calibrated scales are provided for the ranges −1.5 to +1.5, −7 to +8, −25 to +35 percent impedance deviation and −0.015 to +0.015, −0.07 to +0.07, −0.25 to

A TRANSPARENT ALL-CHEMICAL SOLUTION FOR GRINDING

Lusol K-7 is a new all-chemical liquid concentrate designed for a wide variety of grinding operations. It is recommended for use on all steels and is particularly suited for cast and malleable irons, titanium, carbon, rubber, ceramics and plastics. Instantaneously soluable in any water, hard or soft, it forms a clear, transparent, colorless solution that resists contamination, settles chips super-fast, and remains clear after repeated use. It is non-foaming and runs absolutely flat under all conditions. It provides maximum rust protection for all ferrous metals, including cast and malleable irons. It maintains clean wheels at all times. They just don't load up when you use Lusol K-7. For better grinding every time, use Lusol K-7. Write for complete information.

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THE DAVIDSON MODEL D-600

COMPARISON AUTOCOLLIMATOR

This new type angle-comparator permits accurate and repeat measurement of the difference in angle of the returning beams to 1/10th second of arc.

It allows comparison and measurement of small angles to a precision heretofore considered impossible.

Patented design, employs a unique arrangement of optical tipping plates coupled to a calibrated micrometer dial.

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GUSHER Coolant Pumps

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Popular Model proved in performance by many leading machine tool builders

This United States #1 Hand Milling Machine manufactured by U. S. Burke Machine Tool Co. is equipped with a Gusher Coolant Pump.

Gusher Coolant Pumps are available in a wide variety of models to fit almost any requirement. You can choose from immersed, pipe connected, and flange mounted for external or internal discharge in either motor or belt driven types. Tank mounted models for portable use are also available.

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THE RUTHMAN MACHINERY CO.
1810 READING ROAD CINCINNATI, OHIO

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+0.25 phase angle deviation in radians.

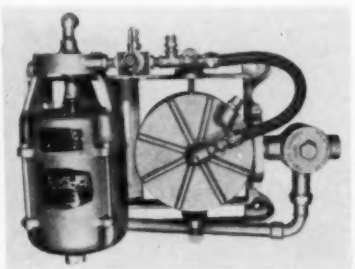
The new deviation test bridge model BL-1506 has a 100-kc bridge frequency for the test ranges 10 to 50,000 ohms resistance, 25mfd to 0.1 mfd capacitance, and 20 microhenry to 80 millihenrys inductance. The other instrument model BL-1504 has a 1-kc test signal.

For automatic inspection the meter can accommodate 4000 units per hour. A knee operated test jig accessory facilitates manual inspection procedures.

Brush Electronics Co., 3405 Perkins Ave., Cleveland, Ohio. **T-3-2921**

## Hot Spray Painting

New quick-change color selector system features this hot-spray unit. A selector valve is combined with the heater to offer the advantages of hot spray for installations requiring frequent color changes, as well as for continuous-duty



single-color operations. Because clean-out and color change take less than a minute, the system will serve where a separate heater would otherwise be required for each color. Development of a simple and maintenance-free unit with a coil-less heat exchanger and centrifugal pump represents another step in the expanding use of the hot-spray method.

Spee-Flo Co., 720 Polk Ave., Houston, Tex. **T-3-2922**

## Plastic Spray Coating

New plastisol can be applied as received with conventional spray equipment—no thinners or solvents are required. Applied with a spray, Miccrosol Spray S-2003 provides a nonporous film. Films of 60 mils thickness can be applied in one application without sagging of material. If multiple coats are required, a short cure time is all that is needed between applications.

Microsol Spray S-2003 has the same toughness—chemical, corrosion, and abrasion resistance as Miccrosol E-1003. It can be used as a coating for all plating baths and Miccro adhesive systems provide outstanding adhesion to metal surfaces. When properly applied and cured, S-2003 is equivalent on a per

mil basis to E-1003, properly applied and cured. For cleaning ease, better rinsing and draining, as well as an attractive appearance, the exceptionally high gloss of Miccrosol Spray S-2003 is definitely advantageous.

Michigan Chrome and Chemical Co., 8615 Grinnell Ave., Detroit 13, Mich.

**T-3-2931**

## Profilometer Tracer

Type LJ Profilometer tracer, developed to measure surface roughness of more than 85 percent of the varied surfaces produced by industry, can be operated by Mototrace or by hand. Tracer point of the instrument is at the end of a projecting beam and is supported on the work surface by 3 interchangeable skidmounts.

Type FP skidmount has a small-diameter nose, with a single skid directly back of the tracer point. Used for mechanical tracing with a mototrace, it measures on ID's as small as ¼ in.; OD's as small as ⅛ in.; flats and tapers. The single-skid construction permits its use on splines and other narrow surfaces.

Types FL and FM skidmounts have two skids—one at each side of the tracer point—and are used for manual operation, with the tracer held by a plastic clip or attached to a stiff arm or extension arm. They also may be used for Mototrace operation. The type FL skidmount is used on ID's from ½ in. to flat; and the Type FM skidmount is used on OD's from ⅜ in. to flat. Both may be used on gear teeth as small as 10 DP.

Micrometrical Mfg. Co., 345 S. Main St., Ann Arbor, Mich. **T-3-2932**

## Milling Machine

Variable-speed drive on this recently developed vertical milling machine provides any desired feed from 80 to 570 rpm in low range, and 584 to 3800 rpm in the high-speed range with no belt changes. A built-in tachometer makes the exact spindle speed visible to the operator.

Quill feed provides a range of power feeds from 0 to 0.008 ipr. Simple positive control of the quill feed makes it


ACCO products

# Wilson "Rockwell"* Hardness Testers

## Is HARDNESS an important factor in your business?

• If your business involves metals, successful operation often requires *exact* knowledge of the proper hardness of the materials you make or work with.

**In heat treating departments** ▶ WILSON "ROCKWELL" testing of hardened and tempered steels is universal.

**In metallurgical laboratories**

They provide means for establishing thousands of hardness specifications.

**In the tool room**

They are relied upon for absolute guidance as to the hardness of tools and the metals to which they are applied.

◀ **In the inspection department**

Inspection of parts to see that they actually meet specifications is an important use of WILSON "ROCKWELL" hardness testers. On the inspection line they help insure the quality of the product, reduce defects, and retain the good name and reputation of the manufacturer.

**In the production department** ▶ WILSON "ROCKWELL" hardness testers are ideal for use in production testing. The test, complete from work insertion, loading procedure, feeding, removal of work piece—is a matter of three to five seconds depending on the skill and dexterity of the operator.

• For complete information on "WILSON ROCKWELL" Hardness Testers call or write today. There is a WILSON model to meet every testing requirement.

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New! Different! Interesting! Easy too . . . and you win two ways in the Wendt-Sonis "Cut Costs" Contest. Who's eligible? Anyone employed by a company using the new superior Wendt-Sonis tool holder for throw-away inserts — a proven cost cutter. Keep a record on how you did it — how you "cut costs." Enter the facts on a simple-to-fill-out entry blank — send it to Wendt-Sonis Company for a chance at the prizes. Contest closes June 30, 1956. You win two ways — a chance at the prize — your job done at lower cost with Wendt-Sonis tool holders for throw-away inserts.

**briefly — here's all you do . . .**

1. Use the coupon below to get your entry blank and clear-cut easy-to-understand contest rules.
2. Be sure you have Wendt-Sonis tool holders for throw-away inserts on your job.
3. Jot down the facts and figures on the job for filling in the standard entry blank. You can base your example on lower tooling costs . . . less downtime . . . more parts per hour . . . *all* of these three . . . or any other savings you accomplished with Wendt-Sonis tool holders for throw-away inserts. Don't worry about neatness, spelling or size and type of job. Enter more than one job if you wish!

Don't be concerned about our using your name or company name in advertising. We wouldn't do that without getting your permission first.

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1st $2000.00
2nd $1000.00
3rd $ 500.00
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and 25 $50 PRIZES
for
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Elmer J. Tangerman
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American Machinist

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Wendt-Sonis Co.
Dept. TE-356, Hannibal, Mo.

I want a chance to win in the Wendt-Sonis Tool Holder "Cut Costs" Contest. Rush me rules and entry blank.

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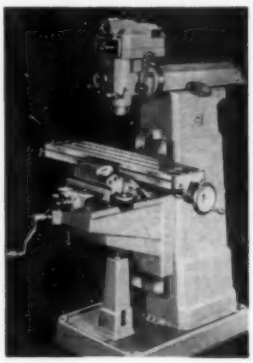
easy to obtain correct depth when blind drilling to a given depth. Moving the quill feed control lever to neutral position stops the spindle feed. A positive clutch in the center of the quill handwheel also provides instant quill feed control.



Construction and design features permit the unit to operate smoothly, even on heavy cuts. There is no motor shock and no motor vibration is transferred to the spindle.

The machine's ground table has a 36 x 9-in. working surface. The range is 18 in. longitudinal; 10 in. transverse; and 16⅝ in. vertical. The spindle nose is collet chuck type. The head, which is easily swiveled 360 deg, rotates on a rigid sleeve mounting that maintains right-angle alignment with no sag between the head and the ram.

Logan Engineering Co., 4901 W. Lawrence Ave., Chicago 30, Ill. **T-3-2941**

## Table Adjustment Indicator

Close tolerance tapers may be ground with accurate control by means of the dual electric indicator for measuring swivel table adjustment. This device, called Swivalign, is applicable to Norton cylindrical and universal grinding machines. It simplifies adjustment of swivel tables to correct errors in grinding exact tapers or to avoid taper in straight work.

It consists of one electrical pickup unit with zero adjusting knob at each end of the swivel table and a two-channel amplifier having a pair of indicating

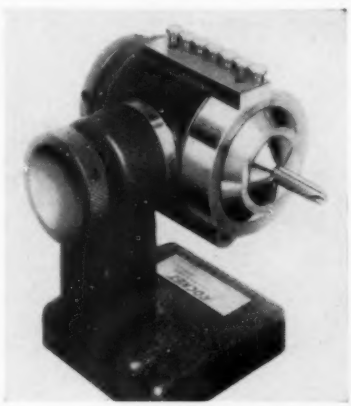
meter elements reading on a common scale. Each meter needle responds to movements of only one of the pickup elements.

Divisions on the meter scale indicate taper changes in thousandths of an inch per foot of taper. Two ranges of readings, one for extremely accurate settings with graduations of 0.0001 in. per foot and the other 0.005 in. per foot of taper change are provided. The desired range is obtained by a selector switch on the front of the instrument case. A conversion chart on the side of the instrument case gives taper foot values for corresponding micrometer readings of work diameters.

Norton Co., Worcester 6, Mass. **T-3-2951**

## Tap Sharpener

An improved tap sharpener allows greater clearance for the head pivot due to added height of the upright member of the cast-iron base. Pushbuttons on the head have been improved and



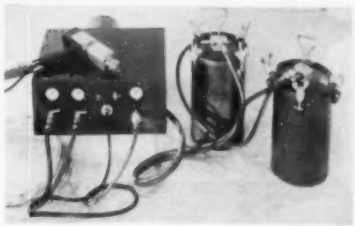
strengthened. Buttons control indexing or amount of turn on the tap, while the head itself adjusts quickly from 0 to 90 of angle to grinding wheel.

Designed to resharpen either left or right-hand taps of two, three or four flutes in a matter of minutes, the tap sharpener can be used on any make or size grinder with a magnetic chuck. Holes may be drilled in base to permit its use on standard grinder. Equipped with one ½-in. collet, the unit will accommodate any standard 5-C collet of ⅛ to 1-in. capacity.

Rockford Die & Tool Works, Inc., Rockford, Ill. **T-3-2952**

## Spray Gun for Plastics

Spray gun for epoxy resins incorporates an electrically heated element for maintaining proper spraying temperature, a special nozzle that mixes the material just prior to leaving the gun, and



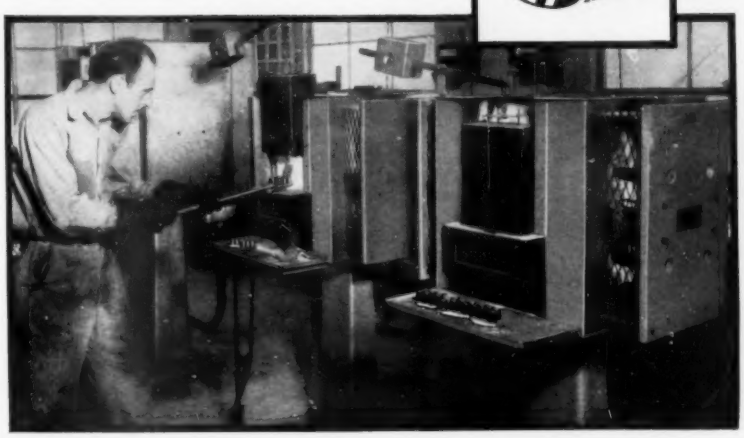
a metering device for positive proportioning of materials. It has been found to be particularly useful for protective coating for metals and wood. The gun also adapts itself economically to laminating glass cloth.

Kish Industries, Inc., 1301 N. Turner St., Lansing, Mich. **T-3-2953**

## Bending Rolls

Series of 6-in. all-steel rolls, known as the D series, are made in lengths of 48, 60, 72, 96 and 120 in. Rolls are of the initial or pinch type. Standard features include the parallel adjustment of the rear or forming roll by a handwheel in front of the machine; a safety


**LOW PRICED MOLY for HIGH GRADE TOOLS?**



SENTRY FURNACES employing the positive Sentry Diamond Block atmosphere harden all high speed and air hardening steels including the low-priced molybdenum steels, consistently without spoilage, true to size and completely free from scale or decarburization.

Many users of Sentry equipment are regularly hardening the M-10 and other "difficult" steels with absolutely no "decarb" – producing high quality tools from lower cost steels.

Like the manufacturer of the above shown struck slot hammer, you, too, can save money with a Sentry installation.

Consult Sentry for free demonstration hardening on your own tools.

Request Catalog L-47 *Write*

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13" PRECISION TURRET LATHE

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A new, quality-built turret lathe that can deliver high output and close tolerances on precision parts. It features exceptional ranges of facing, turning, ram and threading feeds; handling ease and rigidity. Maximum efficiency on all types of jobs.

Send for complete information if you are interested in producing more precision parts at lower costs. Prices start at $2,344.

**SPECIFICATIONS:** Swing 13½" • Collet capacity 1" • Turret feeds 144 • Turning, Facing, Threading feeds 48 each • Spindle speeds 12.

**SOUTH BEND LATHE**
South Bend 22, Indiana
*Builders of lathes, milling machines, shapers, drill presses, grinders.*

SOUTH BEND

INDICATE A-3-296-1


treadle that extends the full length across the front; stepping on the treadle immediately stops the machine.

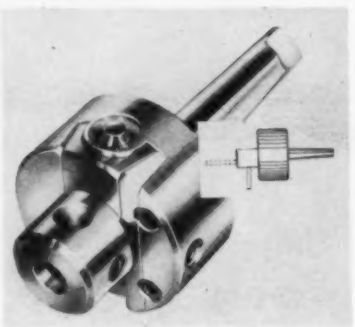
A single lever releases the drop-end, which, when lowered, raises the upper roll. All three rolls are power driven. Drive is a 7½ hp, 1800 rpm motor.

Rolls are accurately machined alloy steel, grooved to specifications. Frames are all steel weldments.

Optional equipment includes an air-power operated drop-end equipped with an air vitalizer unit; a power adjustment for the rear roll operated by a ¾-hp magnetic brake motor with push-button starter and forward and reverse control; a magnetic brake main drive motor; and a cone rolling attachment.

Wysong and Miles Co., Greensboro, N. C. **T-3-2961**

## Offset Boring Head



New offset boring head has ⅝ in. bar capacity and provides both perpendicular and parallel holding of tools. Known as Model 43-B, it has a round body contour of 2¾-in. diam. The tool block extension is also round. It has a built-in micrometer adjusting tool block offset to ⅝ in. in increments of 0.001 in.

Flynn Mfg. Co., 133 Flowerdale, Ferndale 20, Mich. **T-3-2962**

## Carbide Countersinks

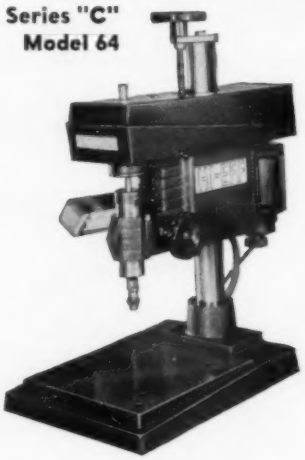
Carbide chatter-free countersinks have the advantages of less down time, increased production, greater precision, longer consistency of operation. Cost of regrinding is generally less than the price of new high-speed countersinks.


New!

for sensitive precision drilling!

HI-EFF

Series "C"
Model 64



Like its companion models in Series A and Series B, this new, low cost Series C, Model 64, is designed for sensitive, precision drilling on a production basis. Variable spindle speeds from 800 rpm to 10,000 rpm. Drills holes from .001" to .125" diameters. Compactly designed for maximum operator efficiency. Write for bulletin.

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## TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

| Literature Number | COMPANY | DESCRIPTION |
|---|---|---|
| A-3-274 | Ace Drill Corp. | Drill Blanks—Catalog No. 52-B contains information on Ace "Ground-from-the Solid" Drills and hardened H.S.S. drill blanks. (Page 274) |
| A-3-470 | American Broach & Machine Co. | Broaching Machines—Broaching manual is contained in the American catalog No. 450. (Page 470) |
| A-3-400-4 | American Pullmax Co., Inc. | Special Machine—Pullmax catalog contains information on metal-working jobs. (Page 400) |
| A-3-24 | The American Tool Works Co. | Radial Drilling Machines—Bulletin No. 327 contains data on the American radial drilling machine. (Page 24) |
| A-3-350 | B. C. Ames Co. | Dial Indicators—Catalog contains data on the Ames line of dial indicators. (Page 350) |
| A-3-283 | Armstrong-Blum Mfg. Co. | High-Speed Hacksaw—Bulletin GP35 describes the features of the Marvel No. 4B High-Speed hacksaw. (Page 283) |
| A-3-374 | The Aro Equipment Corp. | Air Tools—Bulletin 5546-T contains information on Par-A-matic drills used in multiple installations. (Page 374) |
| A-3-329 | The Atrax Co. | Carbide Tools—Atrax Solid Carbide Bur Selector Chart available for display purposes. (Page 329) |
| A-3-448-1 | Barksdale Valves | Air Valves—Information on standard and sub-base mounted four-way air valves available upon request. (Page 448) |
| A-3-326 | Barnes Drill Co. | Separators—Data on automatic magnetic separators available in Bulletin 151G. (Page 326) |
| A-3-275 | Behr-Manning Div. of Norton Co. | Hand Stoning—Handbook contains description of oilstone line. (Page 275) |
| A-3-385 | Buck Mfg. Co. | Work Holding—Literature on new Bux magnetic drill vise and name of nearest dealer available upon request. (Page 385) |
| A-3-423 | The Bullard Co. | Boring Machine—Catalog describes the Bullard H.B.M. Model 75 horizontal boring machine. (Page 423) |
| A-3-67 | The Carlton Machine Tool Co. | Radial Drills—Twenty-four-page booklet describing the Carlton line of horizontal and radial drills. (Pages 66-67) |
| A-3-523 | Chicago Pneumatic Tool Co. | Hand Tools—Bulletin SP-3165 contains case histories on "Magnamatic" screwdriver-nutrunner. (Pages 522-523) |
| A-3-461 | Ciba Co., Inc., Plastics Div. | Plastics—Data available on Epocast resin; also Ciba epoxy resins. (Page 461) |
| A-3-59 | Cincinnati Bickford Div. Giddings & Lewis Machine Tool Co. | Radial Drills—Booklet R33 contains data on radial and upright drilling machines. (Page 59) |
| A-3-57 | The Cincinnati Milling Machine Co. | Hydroforming—Bulletin M-1906 contains data on hydroforming. (Page 57) |
| A-3-70 | Clearing Machine Corp., Div. of U.S. Industries, Inc. | Presses—Brochure entitled "Thinking about a Better Way To Do the Job?" available upon request. (Page 70) |
| A-3-316 | The Cleveland Crane & Engineering Co. | Shear Equipment—Catalog No. 2011 gives construction and engineering details of new toe control. (Page 316) |
| A-3-319 | Cogsdill Tool Products, Inc. | Deburring Tool—Descriptive folder available showing speed charts and engineering data of Cogsdill deburring tool. (Page 319) |
| A-3-477 | Crane Packing Co. | Lapping Machines—Possibilities for production lapping are contained in illustrated booklet. (Page 477) |
| A-3-505 | Danly Machine Specialties, Inc. | Die-Set Data—Two hundred pages of die-set data available in new Danly catalog. (Page 505) |
| A-3-288 | Ferguson Machine & Tool Co., Inc. | Index Tables—Catalog No. 300 contains data on speeding up production or converting to automation with index tables. (Page 288) |
| A-3-328 | William H. Field Co., Inc. | Grinders—Folder tells about the new method for grinding helical cutters. (Page 328) |
| A-3-424 | George Gorton Machine Co. | Milling Machine—Information available on Gorton 9-J Super-speed vertical mill with True-Trace hydraulic installation. (Page 424) |
| A-3-386 | Greenlee Bros. & Co. | Automatics—Catalog No. A405 contains information on Greenlee automatic bar machines. (Page 386) |

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| A-3-18 | The Ingersoll Milling Machine Co. | **Milling Cutters**—Catalog 66F contains data on Ingersoll Shear Clear face mills. (Page 16) |
| A-3-401 | Jes-Cal Co. | **Honing Tools**—Bulletin JC-101 contains data on honing tools. (Page 401) |
| A-3-10 | Kennametal Inc. | **Die Steel**—Booklet B-100 contains data on die steels. (Page 10) |
| A-3-377 | Mead Specialties Co. | **Fluid Feed**—Special 4-page folder contains data on new Mead feeds. (Page 377) |
| A-3-36 | Metal Cutting Tools Inc. | **Core Drill**—Brochure contains information and specification on Metcut new pin-mount core drill. (Page 36) |
| A-3-346 | Micrometrical Mfg. Co. | **Surface Measurement**—Bulletin LT17 contains data on the Profilometer Group 2 with new type LJ tracer. (Page 346) |
| A-3-367 | A. Milne & Co. | **Tool Steels**—Milne's new tool steel selector available upon request. (Page 367) |
| A-3-288-1 | Monroe Engineering Products, Inc. | **Fixture Details**—Illustrated catalog contains data on the Monroe line of fixture details. (Page 288) |
| A-3-431 | Nice Ball Bearing Co. | **Ball Bearings**—Catalog No. 150 contains data and engineering specifications on Nice ball bearings. (Page 431) |
| A-3-413 | The OK Tool Co., Inc. | **Milling Cutters**—Catalog 13 gives data on OK carbide insert blade cutters. (Page 413) |
| A-3-372-3 | Petz-Emery Inc. | **Dial Indicators**—Bulletin 455-D contains data on the new M-3 precision dial indicators. (Page 372) |
| A-3-25 | Pines Engineering Co., Inc. | **Bending Machines**—Cost-cutting ideas in latest bending and end-finishing techniques are discussed in Pines News. (Page 25) |
| A-3-331 | Reed Rolled Thread Die Co. | **Thread Rolling**—Bulletin 8-1 contains data on thread-rolling attachments for automatic screw machines. (Page 331) |
| A-3-400-1 | J. A. Richards Co. | **Bending Machines**—Illustrated folder TE-5 contains data on the multiform Big-Brother bender. (Page 400) |
| A-3-387 | Rivett Lathe & Grinder, Inc. | **Hydraulic Power Units**—Requirements, specifications and drawings are contained in catalog. (Page 387) |
| A-3-327 | Seibert & Sons, Inc. | **Special Tools**—Bulletin describes types of Seibert holding and driving tools. (Page 327) |
| A-3-437 | Simonds Abrasive Co. | **Grinding Wheels**—Bulletin ESA 197 contains data on Simonds W Borolon White Wheels. (Page 437) |
| A-3-271 | The S-P Mfg. Corp. | **Power Chucks**—Catalog 105 contains data on power chucks. (Page 271) |
| A-3-337 | Standard Parts Co. | **Fixture Components**—Catalog gives illustrations and describes the jig and fixture components of Standard Parts Co. (Page 337) |
| A-3-381 | Stupakoff Div. of The Carborundum Co. | **Cutting Tools**—Bulletin gives production figures with Stupalox Tools; also physical, mechanical properties and operating data. (Pages 380-381) |
| A-3-504-2 | P. A. Sturtevant Co. | **Torque Wrenches**—Data concerning torque wrenches is contained in catalog. (Page 504) |
| A-3-445 | Super Tool Co. | **Cutting Tools**—Ninety-two page catalog contains data on carbide drills. (Page 445) |
| A-3-266-1 | Twentieth Century Mfg. Co. | **Cutting Tools**—New selective catalog No. 10A available upon request. (Page 266) |
| A-3-58 | The Van Keuren Co. | **Carbide Plug Gages**—Two-hundred-fifty-eight-page catalog and Handbook No. 36 contain technical engineering information on measuring problems and methods. (Page 58) |
| A-3-391 | Vascoloy-Ramet Corp. | **Metal Cutting**—Catalog contains information on V-R Carbide products. (Pages 390-391) |
| A-3-334 | Wales Strippit Corp. | **Die Equipment**—Bulletin No. 12B is illustrated with actual job work and data for time-saving applications. (Page 334) |
| A-3-342 | S. B. Whistler & Sons, Inc. | **Magnetic Die**—Catalog describes Whistler magnetic dies illustrating speed and simplicity of setup. (Page 342) |

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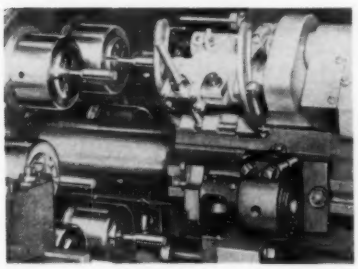
Severance Tool Industries, Inc., 728 Iowa St., Saginaw, Mich. **T-3-2991**

## Milling Attachment

Attachment for multiple-spindle automatic screw machines permits milling any number of flats or slots, while the part is turning in the spindle. It operates during the normal screw machine



cycle and advances with the end tool slide, or can be accelerated.

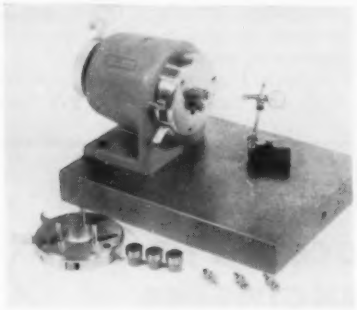
Attachments are available for every size and make of multiple-spindle automatic screw machines. They are set up fast and easily, and are adjustable to the full capacity of any machine. Concentricity is assured to 0.0001-in. accuracy, because the cutters rotate around the stock.

Turnmill Inc., 25450 Ryan Rd., Center Line, Mich. **T-3-2992**

## Gaging Fixture

Gaging fixture checks shoulder squareness relative to the center line of product threads. Simple to operate, this fixture is expected to find widespread application in the aviation industry and wherever extreme accuracy is required in threaded parts. Using readily interchangeable roll holding plates and interchangeable gaging rolls, the fixture provides an inspection range from ½ to to 1½ in. thread diameter. Inherent accuracy is approximately 0.0002 in. total indicator reading at 1½ in. diameter.

Used in conjunction with an ordinary dial indicator, the fixture consists basic-



ally of a gaging head mounted on a precision aligned spindle. Special ball thrust bearings insure squareness. In operation, a lever arm is actuated, opening the gaging rolls carried on the gaging head. The product thread is placed on the rolls carried on the gaging head. The product thread is placed on the rolls and the arm is released. The spindle and head are rotated so that errors in squareness are easily read in terms of total indicator reading.

Pratt & Whitney Co., Inc., West Hartford, Conn. **T-3-2993**

## Compact Test Chamber

Environmental test chamber is designed with an overhead type door which lifts up clear of obstructions so that it can be installed in locations of limited space.

A special safety feature of construction is that the air cylinder which raises and lowers the door is counterbalanced, so that in case of air failure the door will not open or close from any position.

Available from 5 to 64 cu ft, the cabinet will simulate altitudes from sea level to 100,000 ft, temperatures from −100 F, and lower, to 500 F and high-

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*smallest size*

*Reamers*

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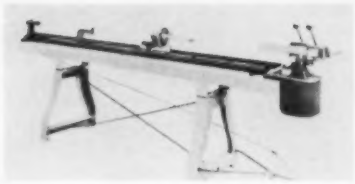
**CHICOPEE, MASS.**

INDICATE A-3-299

er, with a relative humidity from 20 to 95 percent.

American Research Corp., Bristol, Conn. **T-3-3001**

## Tube Bending Machine



This machine is designed primarily for extended runs where more than one bend per tube is required. Self-indexing system presets machine for entire sequence of bends. Tubing remains in machine throughout bending process. Automatic stops control tube rotation, angle, degree and spacing of bends, providing uniformity of finished pieces. All annealed ferrous and nonferrous tubing from ¼ to 1-in. OD is accommodated by this manually operated, floor model machine.

Leonard Precision Products Co., 9200 Bolsa Ave., Santa Ana, Calif. **T-3-3002**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## Direct Setting Gage

Fast, adaptable and extremely accurate, this direct setting electrolimit gage is ideal for gaging parts of similar but different sizes; for gaging several dimensions on a single part; for use as a comparator on short runs involving a few to a few hundred parts; and for a wide variety of other precision inspection and gaging jobs. Capable of quick, easy setting direct to 0.0001 inch without the use of masters, this gage also gives comparative readings direct to 0.00005 in. on a full scale of plus or minus 0.001 in. Total range of the gage is 6 in.; repeatability is with 0.00005 in.

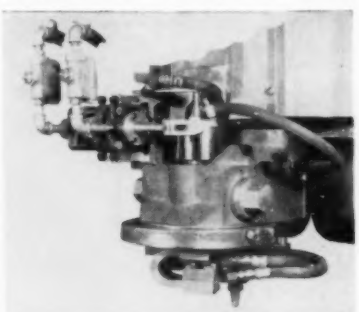
Standard gage blocks are used to set the gage for even inches. Fractional inch settings are obtained by operating

a handwheel that elevates the gage head through a precision micrometer screw. The desired setting is read direct to 0.0001 in. on the setting counter. Resetting within the established inch range is accomplished by simply turning the handwheel as required.

The Pratt & Whitney Co., Inc., West Hartford, Conn. **T-3-3003**

## Welding Head

It is now possible to achieve contoured seam welds with the recently developed stitch welding head which

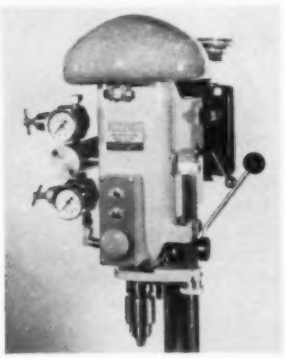


guides spot welding electrodes. Either spaced or overlapping spots on any contour pattern may be used, permitting more freedom in product design than has previously been available. The stitch head may be mounted on any press welder and replaces the upper electrode.

Features of the unit include: indexing head, fully water-cooled, operating speed up to 100 spots per minute, full 360 deg rotation, 3-in. maximum radius of pattern, ½ in. maximum radius of pattern, 400 lb maximum electrode force, and cams available for practically any contour.

The Taylor-Winfield Corp., Warren, Ohio. **T-3-3011**

## Drill Head

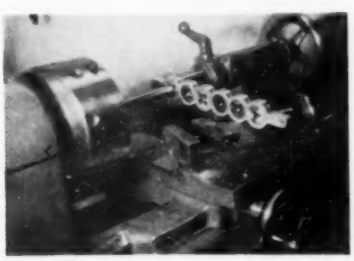


Air-hydraulic drill head will be available in both column mounting and platen mounting types in several sizes and capacities. The column mounting type is shown. A separate hydraulic control cylinder is built into the head, preventing air from getting into the oil, eliminating maintenance problems.

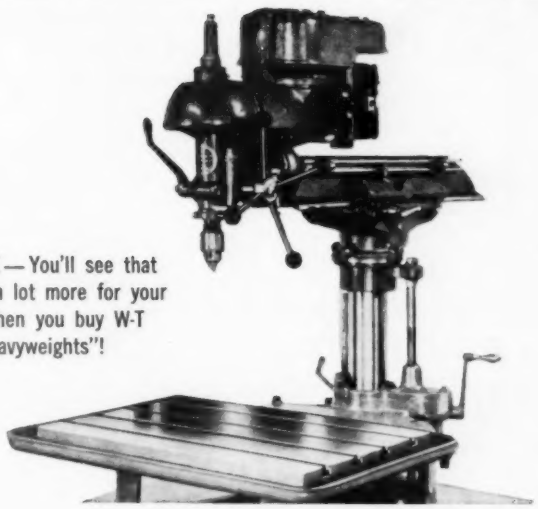
The Rotafeed Co., 2826 E. Grand Blvd., Detroit 11, Mich. **T-3-3012**

## Multiple Threading Die Holder

Threading die holder, with six adjustable dies will cut full thread with one pass. The tool is designed so the face of the die and back of holder are parallel. To cut a thread, operator selects the holder with the die size, then



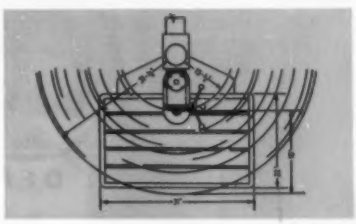

W-T WALKER-TURNER



COMPARE — You'll see that you get a lot more for your money when you buy W-T "Light-Heavyweights"!

**Big, cumbersome jobs are duck soup to this adaptable Radial Drill Press!**

This is your drill press for big, bulky jobs, where it's faster and easier to move the drill head than the work. This Walker-Turner Radial Drill gives you really *big* under-the-drill capacity — you can drill to the center of a 62″ circle, or locate the drill anywhere on sheet stock up to five feet wide. Perfect for sheet stock of all kinds, plywood, switchboard panels.



**1600 Series — "Light-Heavyweight" Radial Drill Press** — Ram travel, 18″; spindle travel, 4″ (special models available with 6″ spindle travel). Six-spline, full floating spindle. Spindle speeds from 110 to 8300 rpm. Capacity to ½″ in cast iron. Drill head and motor assembly tilt to 45°, right or left.

Your Walker-Turner Distributor will demonstrate the unusual versatility of this Radial Drill. He's listed under "Tools" in your phone book's Yellow Pages. Or write for his name, and full specifications.

DRILL PRESSES, HAND AND POWER FEED — AIR FEED DRILL PRESS ATTACHMENT
RADIAL DRILLS — WOOD AND METAL CUTTING BAND SAWS — TILTING ARBOR SAWS
RADIAL SAWS — JIG SAWS — CUT-OFF SAWS — LATHES — SPINDLE SHAPERS
JOINTERS — BELT AND DISC SURFACERS — FLEXIBLE SHAFT MACHINES

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**WALKER-TURNER**
Division
Kearney and Trecker Corporation • Plainfield, N. J.

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**ONE Drill Grinder Sharpens ALL Drills**

- 90° to 140° Included Angle
- 1/8" to 2 1/2" Diameter
- 2-3-4 Flutes
- Without Chucks or Collets

*Write for complete information on the STERLING Model "DV" Drill Grinder*

STERLING Model "DV" Variable Angle DRILL GRINDER

**This Tool & Cutter Grinder has BIG CAPACITY**

*(11" swing—14" between centers)*

**At LESS Cost**

Sterling Model "RK-2" provides more capacity at half the cost of a Universal Grinder. Write for details.

**McDONOUGH MFG. CO.**

1517 GALLOWAY • EAU CLAIRE, WISCONSIN

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DEKA® BORE

OFFSET BORING HEAD repeats to

**.0001"**

in 30 seconds

DEKA-BORE (and only DEKA-BORE) can be adjusted in fractions of 1/10,000" on the full diameter as easily as reading 1/16" on a steel rule. NOT A VERNIER OR SCROLL ADJUSTMENT. Can be calibrated in increments of .00005 on radii or .0001 on diameter as easily as picking up .002 on a conventional micrometer dial.

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mail coupon now for free demonstration or literature!

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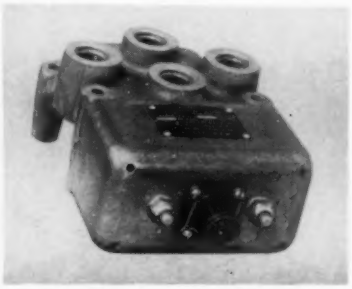
rests the back of holder against tailstock of lathe, thus guiding die onto the workpiece.

A set of three 6-in-1 holders with 18 adjustable dies will cut NC and NF threads 1/8 to 1/2 in., plus 1/8 and 1/4-in. pipe threads. Each die is set in the multiple holder, ready for use. The tool is so designed that necessary adjustment for fit or material may be made simply and without removing the die from its holder.

Mohr Tool & Mfg. Co., Dept. TE, Box 63, Maywood, Ill. **T-3-3021**

## Four-Way Valve



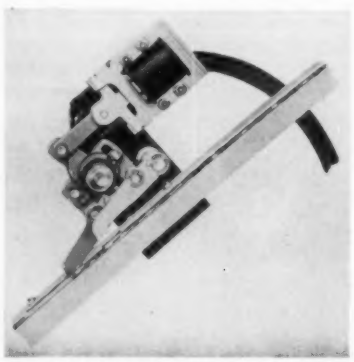
Solenoid-operated four-way pneumatic and hydraulic valves are available in tube sizes from 1/4 to 1/2 in. Some of the features are low current drain, continuous duty operation, fast action, explosion-proof, operating range 0-5000 psi, temperature range −65 to +275 F. and flow rates up to 10 gpm.

Mar Vista Engineering Co., 5420 W. 104th St., Los Angeles 45, Calif.

**T-3-3022**

## Standard Escapement for Parts Feeder

Parts escapement unit is available to manufacturers and design engineers who are planning installation or conversion to automatic parts feeding. Designed to be attached at any point along the feed track, the unit has spring-loaded fingers to automatically release individual parts. The escapement will



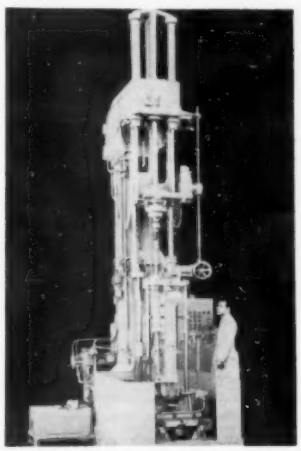
not jam or damage piece parts. No special slots or track junctions are required.

Escapement will automatically release up to 200 parts per minute, one at a time. The fingers can be shaped or formed to accommodate any piece part up to 3-in. in diameter. Escapements are available for solenoid or air cylinder operation. If a convenient vertical movement is available, mechanical linkage may be used.

Dixon Automatic Tool, Inc., 2341 23rd Ave., Rockford, Ill. **T-3-3031**

## Heavy-Duty Honing Machine

Equipped with an eight-speed transmission, this heavy-duty honing machine has a maximum 50-in. hydraulic head stroke and a work diameter capacity of 15 in. It incorporates variable delivery hydraulic pump and tank unit and controls, and a safety interlock to hold the head in the up position. This machine may be obtained with either remote



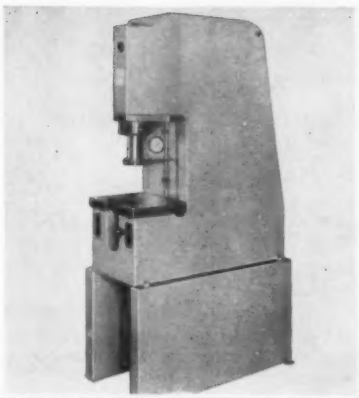
control manual mechanical feed or automatic hydraulic tool expansion.

For ease of loading and inspecting, the internal honing fixture has a tilt-down feature. The rod, keyed to the spindle in the upper end and mounted on a live center at the bottom, is rotated and reciprocated through the OD tool.

Micromatic Hone Corp., 8100 Schoolcraft Ave., Detroit 38, Mich. **T-3-3032**

## Hydraulic Presses

Recently introduced line of high-speed hydraulic presses for fast production gives up to 520 ipm closing and return speeds. Compact and self-contained, they are made in 10 and 20-ton capacities and are designed to use a minimum of floor space.



Controls are sensitive to the touch; the ram can be slowed down or stopped at any point. At the bottom of the work stroke, if the operator's hand or foot is removed from the control, the ram will return to a predetermined setting. Length of stroke can be set from ½ to 12 in., while ram speed closing ranges from 55 to 520 ipm; pressing from 55 to 200 ipm; and return from 110 to 520 ipm. Presses are available as hand, safety dual-hand or foot-controlled. The 10-ton size also can be furnished electrically controlled.

Northern Tool and Machine Co., 1545 N. 31st Ave., Melrose Park, Ill. **T-3-3033**


up to 24,000% faster!

Compare
The Conventional Threading Times with MAN-AU-CYCLE Performance

Man-au-Cycle

WORLD'S FASTEST THREADING LATHE FOR SHORT OR LONG WORK

Whatever your screw cutting operations, Man-Au-Cycle can effect *unbelievable* savings... *Because* the entire operation is automatic and fast!... Operator merely loads the machine which is set for a pre-determined number of passes... Within seconds the screw cutting is completed... and the machine stops — *automatically*. Average setup time — 20 minutes. Maximum Thread length — 30". Max. diameter — 12".

AT CLEVELAND PNEUMATIC
Grinding Time—4 hrs./pc.
Man-Au-Cycle—1 min./pc.

Time on Mill—6.5 min./pc.
Man-Au-Cycle—1 min./pc.

AT LEMPCO PRODUCTS
Thread Mill—4 hrs./pc.
Man-Au-Cycle 3 min./pc.

Thread Mill—2½ hrs./pc.
Man-Au-Cycle—2 min./pc.

AT DREIS & KRUMP
Thread Mill—45 min./pc.
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many other machines in operation...

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Man-au-Cycle CORP. of AMERICA
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## Vertical Boring Machine

Precision, compactness and versatility are designed into this automatic vertical boring machine for boring, counterboring, facing and chamfering. It is capable of maintaining tolerances as close as 0.0001 in. and surface finishes of 10 microinch rms. when properly tooled. Compact and rigid in design, the unit occupies only 4 sq ft of

floor space, and is intended to replace larger, slower and more expensive machines in production of small and medium size parts.

Features of the boring machine are an intermittent or continuous automatic cycle, choice of its use as either an automatic single or multiple unit, or use as a unit of a production line in conjunction with other automatic machines. The standard cycle time is 5 to 80 seconds, however, the machine may be equipped with either a faster or slower cycle. It is also available with or without tooling. Simple to set up and operate, it has low first cost and low tooling costs. Maximum stroke is 4 in. and maximum spindle speed is 8000 rpm.

Wadell Equipment Co., 119 South Ave., Garwood, N. J. **T-3-3041**

## Centers with Replaceable Carbide Tips

Substantially lowering costs and increasing machine production time, this center consists of a holder and a replaceable carbide tip. The holder is tool steel and is available in several standard Brown & Sharp, Morse and Jarno shank tapers. Solid carbide tips are available in ¼ and ½-in. diameters

and are acurate to 0.0003 in. Special shank tapers and tip diameters to customer specifications can also be furnished.

The carbide tips are relatively inexpensive and can be stocked in adequate quantities with minimum investment in materials.

Detroit Reamer & Tool Co., 780 W. Maple Rd., P.O. Box 174, Birmingham, Mich. **T-3-3042**

## Boring Bar Cartridge

Low-priced boring bar cartridge features micrometer adjustable cutting tool with positive positioning, rigid clamping, and no backlash in either direction. Graduations are always visible; all inserts are carbide-tipped, sharpened, and ready for use. This cartridge facilitates making boring bars, face mills, fly cut-

ters and other cutting tools requiring precision adjustment. Boring sizes range from 1 to 5½ in., with ¼, ⅜, and ½-in. tool bits.

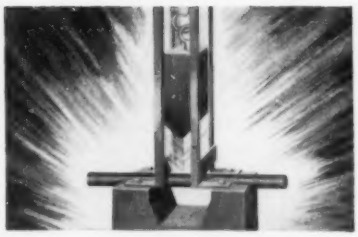
Portage Double Quick Tool Co., 1054 Sweitzer Ave., Akron, Ohio. **T-3-3043**

## Cylindrical Lapper

New 6-in. bench type cylindrical lapping machine is designed to economically provide microinch finishing of piece parts to 1 rms or less. This new machine is compactly made to fit conveniently on top of any workbench.

Capable of producing exacting tolerances, this new unit assures quality control, providing precision lapping for plug gages, cylindrical pieces, tapered plugs and pins and similar piece parts up to 6 in. in diameter.

Many advanced operational features are built into this Spitfire lapping machine. Rings, collets and chucks are not used. It is designed with vented rollers to eliminate "cooling off" peri-

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Atlas Foundry Co., Detroit, Mich.
Banner Iron Works, St. Louis, Mo.
Barnett Foundry & Machine Co., Irvington and Dover, N. J.
Blackmer Pump Co., Grand Rapids, Mich.
Compton Foundry, Compton, Calif.
Continental Gin Co., Birmingham, Ala.
The Cooper-Bessemer Corp., Mt. Vernon, Ohio and Grove City, Pa.
Crawford & Doherty Foundry Co., Portland, Ore.
DeLaval Steam Turbine Co., Trenton, N. J.
Empire Pattern & Foundry Co., Tulsa, Okla.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
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Fulton Foundry & Machine Co., Inc., Cleveland, Ohio
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Kanawha Manufacturing Co., Charleston, W. Va.
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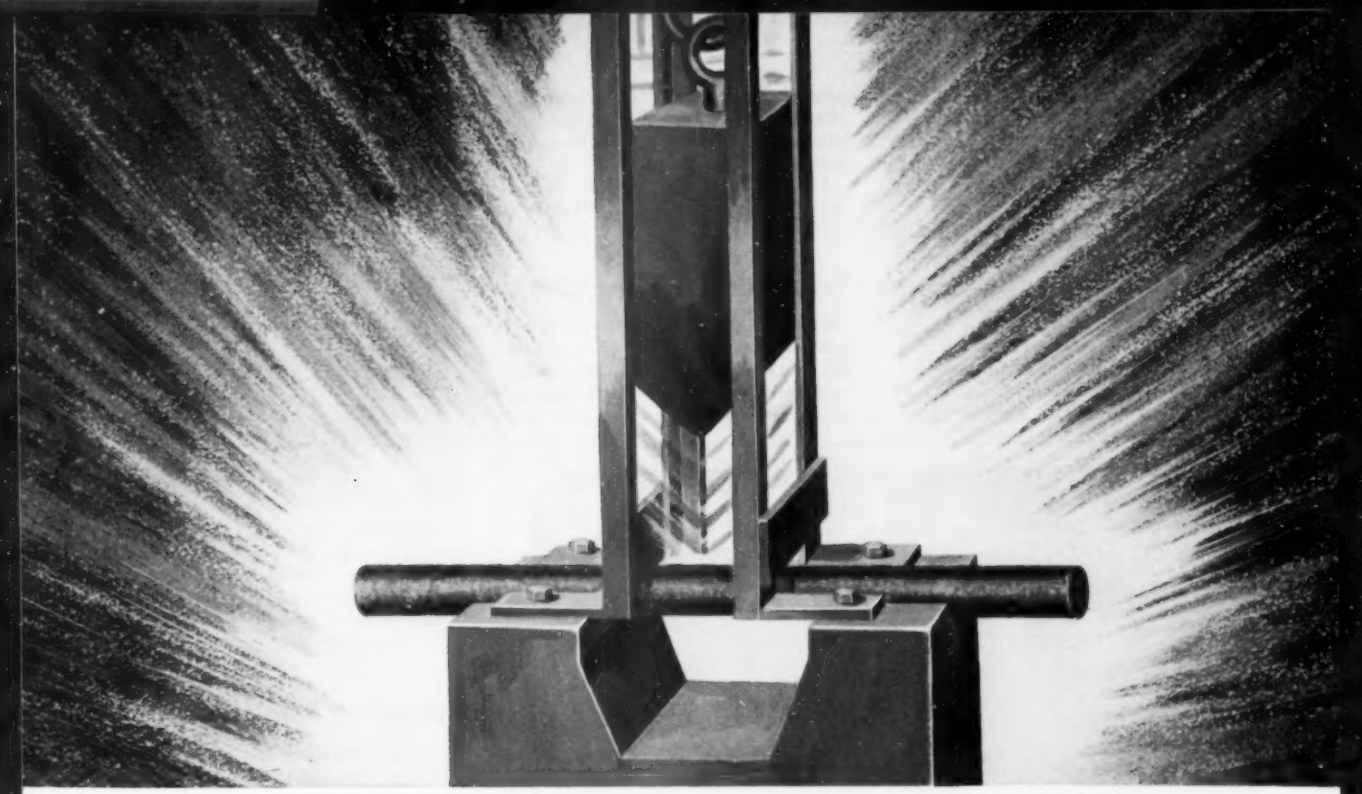
- **HANDBOOK OF MEEHANITE METALS**
- **PRINCIPLES OF HEAT TREATMENT**

***Write today to Meehanite Metal Corporation, Dept. SE, 714 North Avenue, New Rochelle, N. Y.***

**MEEHANITE®**

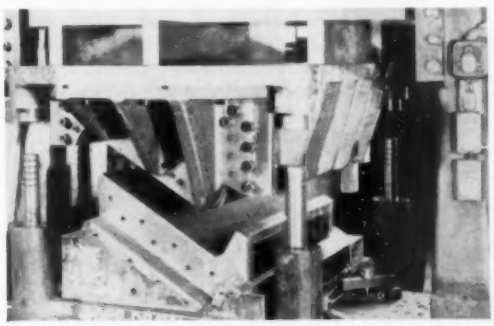


# EXCELLENT SHOCK-RESISTING PROPERTIES OF MEEHANITE CASTINGS OFFER PROOF OF HIGH STRENGTH AND TOUGHNESS

| PERMANENT DISTORTION | | | | |
|---|---|---|---|---|
| Impact Foot Pounds | Mild Steel: Deflection | Cast Steel: Deflection | Type GA Meehanite, As Cast: Deflection | Type GAH Meehanite, Heat-Treated: Deflection |
| 10 | 0 | 0 | .001 | 0 |
| 12½ | .005 | .005 | .004 | 0 |
| 15 | .007 | .007 | .008 | 0 |
| 17½ | .024 | .027 | .013 | 0 |
| 20 | .037 | .047 | .019 | .002 |
| 22½ | .048 | .064 | .027 | .005 |
| 25 | .071 | .089 | .033 | .006 |
| 27½ | .098 | .110 | .042 | .007 |

*These drop test results provide a measure of the impact strength of Meehanite. Test bars (1" dia. x 8" long) were subjected to a series of blows from different heights.*

Structurally controlled Meehanite Metal Castings are available in 26 different property combinations to meet exacting engineering requirements. When superior shock-resistant qualities combined with strength and wear resistance are demanded, Meehanite Metal control provides designers and engineers with assurance of casting uniformity and dependable job performance. *For more information, send for your copy of the "Handbook of Meehanite Metals."*

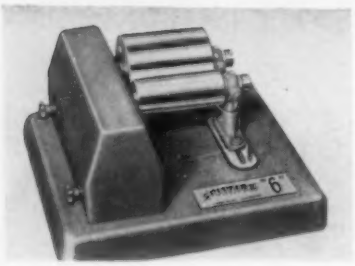


Meehanite Forming Dies give longer service life and freedom from scuffing and galling.

Meehanite Metal Tooth Caps for heavy-duty land clearing rakes provide long wear life without failure under severe impact conditions.

# MEEHANITE METAL®

**MEEHANITE METAL CORPORATION • NEW ROCHELLE • NEW YORK**



ods, permitting increased output. The precision of the close-grain, cast-iron rollers means maximum accuracy in finishing. Other features include self-aligning ball-bearing pillow block, olite bearings and 4-speed interchangeable pulley drive.

Spitfire Tool Co., 2931 N. Pulaski Rd., Chicago 41, Ill. **T-3-3061**

## Toolholders for Carbides

New line of indexible carbide insert toolholders is designed for offset turning and facing operations. Available in right or left-hand offset styles, the tools prefrom either facing or turning or a combination of both in one operation. Four sizes are available for either right or left-hand mounting.

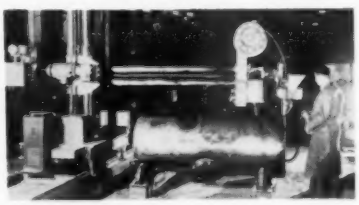
By angling the holder in the tool block 5 deg, the tool can be used for square shoulder turning or facing without resetting. Listed as a semistandard, it incorporates the same band-locking principle of holding the insert as the

standard line of Wesson Multicuts. Standard D-80 solid diamond-shaped carbide inserts with an 80-deg included angle are used.

Wesson Co., 1220 Woodward Hts. Blvd., Detroit 20, Mich. **T-3-3062**

## Automatic Manipulator

Welding head manipulators feature twin tube mast and ram for rigidity. The new line is custom assembled in numerous sizes and models, for self-propelled or stationary types. Designed to the latest concepts of automatic weld-



ing procedures, the new manipulator is readily adaptable to all types of welding heads, submerged arc as well as shielded gas types.

Offering three directional travel, the unit has power-operated vertical travel, variable-speed ram movement, variable-speed carriage drive, and 360 deg mast rotation, either manual or motor operated. Mounting provisions are included for welding machines, flux recovery unit, wire reel, and other accessories.

Worthington Corp., Positioning Equipment Div., Plainfield, N. J. **T-3-3063**

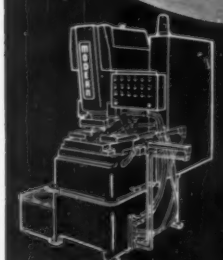
## Electronic Industrial Balancer

Electronic industrial balancers will dynamically and kinetically balance any rotor weighing as much as 5000 lb or as little as 1 pound, quickly, easily and safely.

Some of the new features included in

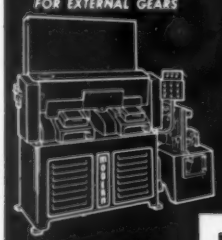

Fully automatic BURR-MASTERS

for deburring internal & external gears and splines



ABOVE: MODEL BMI-15 FOR INTERNAL GEARS

BELOW: MODEL BME-24 FOR EXTERNAL GEARS



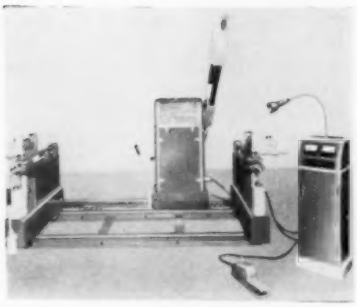
- Entire tooth form including root deburred and chamfered at 5 teeth per second—automatic load, deburr and unload
- Production not limited to a single gear—changes in automation tooling permit wide work range
- Long-life form tools assure maximum production between grinds, rapid changeover
- Two-station BME-24 deburrs both sides of external gears from ⅜" to 6½" P.D. Single-station BMI-15 handles internal gears from 2" to 20" P.D.

MODERN®

Industrial Engineering Co.

14230 BIRWOOD AVE. DETROIT 38, MICHIGAN

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-306



this Stewart-Warner Model 708 are: Diametral range from 1 to 68 in. within 0.04 oz-in. kinetic sensitivity; 0.25 in.$^2$-oz. dynamic sensitivity; choice of flat belt friction or direct drive; remote handle-controlled starting, braking and speed adjustment; walking and locking mechanism for speedy length adjustment; the safety feature of the rotor being held down by a counterbalanced drive belt arm; only about 2-minute setup time without supervision; and many other advanced features.

Merrill Engineering Laboratories, 1240 Lincoln St., Denver 3, Colo.

**T-3-3071**

## Air-line Filter

New air-line filters with automatic-draining facilities have been designed to meet the demand of plants with 3/4 and 1-in. compressed air lines. Norgren models 11,200-6 and 11,200-8 are completely automatic. They create a strong centrifugal force that removes a high percentage of moisture from the air stream. Both models are available with a choice of three types of filter elements for the removal of solids—the standard 200-mesh wire screen (74 micron) and two optional 64 and 25 micron sintered bronze elements. A float-actuated drain mechanism discharges collected moisture automatically under constant or fluctuating air pressure and with or without air flowing. Special protection is provided to prevent entry of solids into the drain mechanism—avoiding clogging and reducing wear. Water capacity of approximately 1¼ pints keeps wear on the drain mechanism at a minimum.

C. A. Norgren Co., Englewood, Colo.

**T-3-3072**

## Analog-to-Digital Encoder

All-electronic device provides fast, precise, and dependable conversion of analog voltages to binary codes. The encoder is asynchronous and is capable of a conversion rate up to 15,000 ten-bit codes per second with a precision of 0.1 percent within limits of instrument.

The Model 1050 encoder can translate the output of analog sensory devices into the binary numbers required in digital computing facilities used for real-time data processing, or for binary coded control applications. Other system applications would be those in which analog information must be transmitted or recorded digitally.

The output of the ACF encoder can be modified to present the digital number either in parallel or serially with the most significant digit first. High sensitivity and freedom from overload resulting from large differences between

at rates up to 288 per hour

Five Burr-Blast models available — manually loaded stationary or continuous rotating units and fully automatic in-line types—permit you to pick the right type and size machine to remove fragmentary burrs from finish machined non-ferrous or cast iron parts. Simple installation uses normal plant air supply from 60 to 80 psi. Built-in flexibility permits burring a variety of parts on any of the Burr-Blast models.

You also benefit from Modern's experience in successfully blast burring a wide range of part shapes and sizes with every known blasting material including: walnut shells, silicon carbide, steel shot, etc.

*Ask for literature describing Modern's Burr-Blast line.*

14230 BIRWOOD AVE. MODERN® Industrial Engineering Co. DETROIT 38, MICHIGAN

See Modern's BURR-MASTERS in action at the ASTE Show — BOOTH 313

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-307

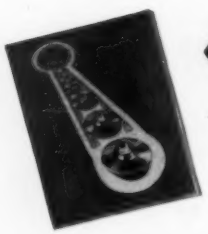
# 60 CALIBER LINKS FOR THE HIGHEST CALIBER PRODUCTION!

**Stations by the dozens . . . tolerances to the ten thousandths . . . production in the millions . . . with progressive dies by**

**B. Jahn**

60 caliber single and double loop links . . . produced by the millions — and hundreds of millions — and all must be absolutely identical, accurate! These stringent specifications demand the finest dies and diemakers — that's why B. Jahn was selected. The master toolmakers and engineers at B. Jahn built a 13 station and 16 station progressive die that formed the intricate components from heavy SAE — 1055 steel. Million plus runs . . . precise fidelity . . . and lasting economy . . . were engineered into every die — and verified by "production proving" in the B. Jahn plant before delivery. Whatever your product, your problem — B. Jahn die making ingenuity can help you deliver better goods . . . in less time . . . at less cost.

Die ribbons showing 13 and 16 stations necessary in producing tremendous runs of shell loop links!



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THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

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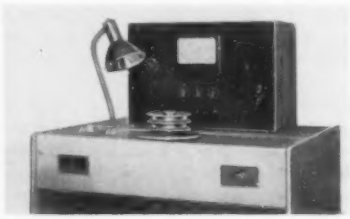
the voltages being compared is achieved by employing nonlinear, negative feedback in a wide-band, direct-coupler amplifier. Chopper stabilization provides drift-free operation.

ACF Electronics, Dept. 204, 800 N. Pitt St., Alexandria, Va. **T-3-3081**

## Static Balancing Machines

Two vertical static balancing machines, recently added to the BEKO line, feature simplicity of operation to insure ease of use by unskilled operators in balancing impellers, blower wheels, flywheels, fans, pulleys and other parts having no integral shaft.



Model 201-VL has weight capacities of 1 to 20 lb; Model 201-VH will handle 5 to 75 lb. Either unit will handle diameters up to 20 in.

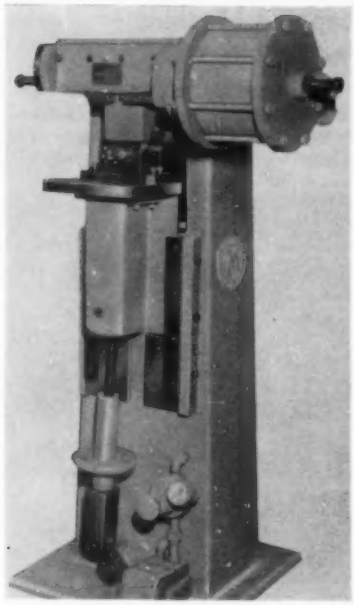
Magnitudes of unbalance are positively indicated by a large, easy-to-read meter, calibrated directly in terms of unbalance correction procedure selected. Angular positions are accurately pointed out by a stroboscopic lamp, and are readable either as a location to remove weight or as a location to add weight, in accordance with the users's correction procedure. Working areas and controls are designed primarily for operator convenience, thus contributing to high production rates on close tolerance work.

MacDell Sales Div., Balance Engineering Co., 850 W. Lake St., Chicago 7, Ill. **T-3-3082**

## Pneumatic Marking Machine

Light, medium or heavy-duty general-purpose marking of round, flat or contoured parts may be carried out by the new #237 full pneumatic marking machine.

The unit features a pneumatic die carriage. A pneumatic table lift produces up to four tons per square inch of marking pressure and provides an air cushion which reduces stress both on the part being marked and on the marking die. Either roller dies for marking flat parts or flat-roll dies for marking round parts are used in the unit, while flat-roll holders or mortised roller dies and quick-change steel types



are also available. Special part holding fixtures should be used where the part being marked is of unusual design or construction.

Capable of marking several lines on parts up to 6 in. in thickness, the #237 is particularly suitable for jobs requiring long, continuous operation by an individual workman. It will mark up to 800 one-inch diameter parts per hour. Because the work is always in full view, the operator is in complete control of every phase of the operation. Depressing the foot valve actuates the complete cycle of raising the worktable and moving the die carriage over the part in a single operation. The reverse cycle is performed by releasing the foot control valve.

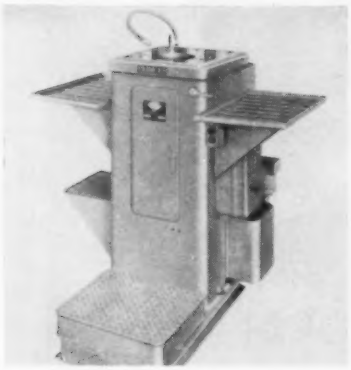
Die stroke on round or flat parts is $3\frac{1}{2}$ in. Table rise by hand adjustment is $4\frac{1}{2}$, or $\frac{1}{2}$ by air.

Jas. H. Matthews & Co., 3923 Forbes St., Pittsburgh 13, Pa. **T-3-3091**

## Pull Down Broaching Machine

Developed to provide heavy-duty, high-powered vertical facilities for internal or surface broaching, this machine is a low-cost unit incorporating an unobstructed worktable measuring 22 in. square. Freedom from all obstructions such as machine framing or ram guides permits practically unlimited range in size of workpiece or broaching fixture. Pull head is easily aligned by screw slide adjustment to precision central relationship with 5 in. diameter faceplate mounting hole.

Available in six or eight-ton models,



the machine is fully hydraulic and features adjustable stroke up to 30 in. Variable cutting speeds up to 23 fpm with return speed to 70 fpm provide ample range for various high-production operations.

Model VT830 is 58 in. in height above floor level and requires a mounting area of 22 by 43 in. It is powered by a self-contained hydraulic power unit, normally base mounted at rear of the machine, which occupies 22 by 37 in. of floor area.

Pioneer Broach Co., 6434 E. Telegraph Rd., Los Angeles 22, Calif. **T-3-3092**


# SHELDON Precision LATHES

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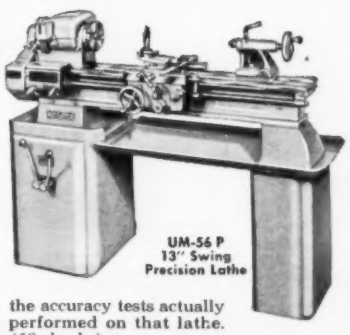
Sheldon lathes are built in the sizes you need most, for toolroom and production jobs. They are available with swings of 10", 11" and 13". . . in varying bed lengths with 18" to 48" center distances . . . and . . . in your choice of pedestal, cabinet or bench mountings.

Powerful, all-V-belt, drive units—either the standard 8-speed (or 16-speed) E-drive; or the production favorite, a rapid, lever-shift U-drive. Where higher spindle speeds are desired, the standard E-drive can be built to provide speeds up to 2,000 r.p.m.

All Sheldon Lathes have handscraped, built-in precision. Each lathe is guaranteed to meet or surpass the American Standards for Toolroom Accuracy. With every Sheldon Lathe goes a copy of the accuracy tests actually performed on that lathe. (19 checks).



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Precision Lathe

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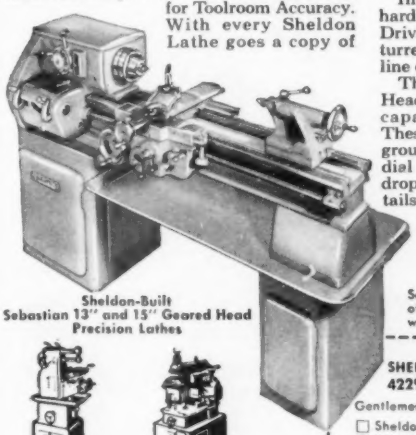

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Sebastian 13" and 15" Geared Head
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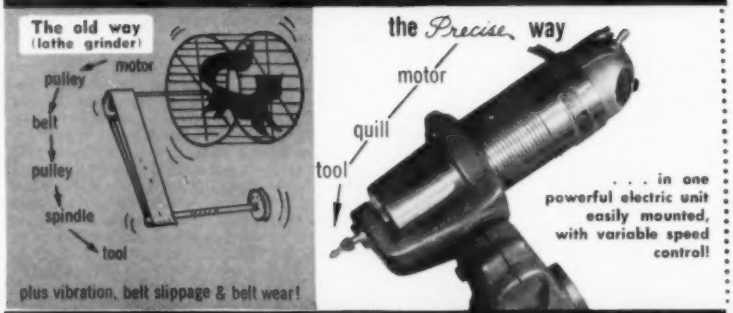


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abrasive wheel, the tool lapper uses readily available domestic abrasives in a fast, accurate grinding operation that requires a minimum of labor and materials, providing a finish even on hardest grades of carbides.

Toolholders are available to accommodate all standard triangular, round and square inserts or throw-aways. Once loaded, the machine requires no further attention until the grinding operation is completed. It provides consistent and controlled microfinish on tools, with end sections maintained parallel and square to the axis of the tool. Machine is furnished with one set of three toolholders, one charge of abrasive, and loading fixtures. Entire unit requires only 18 x 24-in. bench space and operates on 110 volt, a-c current.

Empire Corp., 1566 S. 83rd St., Milwaukee 14, Wis. **T-3-3101**

## Punch Units

Unipunch perforating units for straightline, staggered and over-all gang-punching setups on templates, T-slotted plates and rails in presses and press brakes are equipped with two-piece punches. In this way, the punch heads may be used repeatedly on new or resharpened, low-cost, replaceable and interchangeable punch bodies. Flat

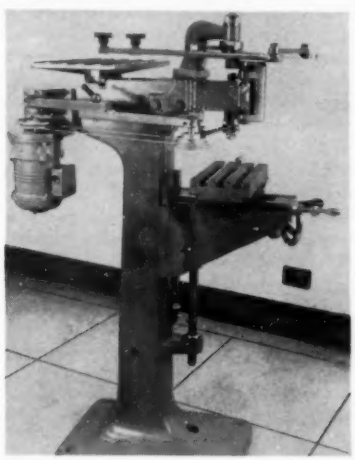
head socket screws fasten the punch bodies and punch heads together into simple-operating punches. Punches are securely locked to the stripping guide assemblies by retainer springs that fit into the groove around the punch heads. Punches are removed from the holder by a simple lifting-out motion and replaced by lowering into top of holder, at the same time compressing ends of retainer springs.

Snap-on strippers eliminate individual stripping guide buttons for each size punch tip. This is made possible by designing unipunch series "B" perforating units to permit guiding the punch the entire length of the long punch-body bearing area instead of only guiding along the short end of the punch tip. These strippers are furnished blank, snapped into retaining grooves at the bottom of the stripping-guide assembly and are punched to size by the punch with the first stroke of the press ram.

Series "B" units are designed around the popular standard 5½-in. shut height and 2 19/32-in. die height for punching round, shaped and clustered holes up to 3½ in. in diameter in material up to ⅛ in. thick.

Punch Products Corp., Niagara Falls, N. Y. **T-3-3111**

## Engraving Machine



An improved Alexander No. 1A standard, 2-dimensional engraving machine, made by George H. Alexander Machinery, Ltd. of England, incorporates features that make it particularly suitable for producing and duplicating extremely fine, precise engravings. The self-contained sliding head includes the pantograph, drive, spindle assembly and swan neck. Simple, direct drive from motor to spindle allows greater accessibility to the head and workpiece. Eight spindle speeds up to 15,000 rpm are provided by the ⅛-hp, 110-v, 60-cycle, single-phase, flange type motor.

Without altering the machine's basic design, working area has been increased 150 percent. To duplicate engravings, the operator simply moves the sliding head over the piece on the worktable.

Standard worktable size is 11⅞ in. long by 6⅝ in. wide. A larger one, 17 5/16 in. long by 11¾ in. wide, can be supplied. This sliding head also is available as a separate unit.

Represented in the United States by J. Arthur Deakin & Son, 150-28 Hillside Ave., Jamaica 28, N. Y. **T-3-3112**

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This tachometer not only indicates speed but also actuates self-contained power relays that signal overspeeds and underspeeds.

High and low limit pointers are independently adjustable. These pointers act as a single-pole, double-throw switch with the regular speed pointer acting as the switch center arm. A manual reset pushbutton resets the tachometer after the relays have signalled a high or low speed.

This tachometer is available with any


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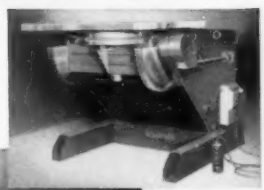
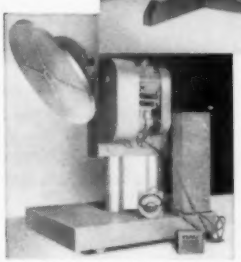
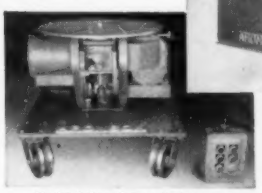


Heavy Duty Precision Built Rubber and Steel Tired Turning Rolls, 100% overload protected. Capacities to 150 Tons. Also Tilting Rolls, Pipe Rolls and Rail Cars.

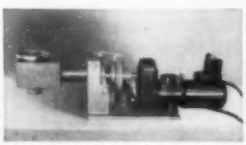


Heavy Duty Gear Driven Positioners, with Magnetic Braking, Mercury Grounding, and Optional Speeds. Capacities to 24,000 lbs.



Heavy Duty Floor Turntables with precision speed control and Magnetic Braking, used for welding, burning, X-raying, etc. Capacities to 75,000 lbs., various heights and speeds.

Fully Automatic Gear Driven Positioners, featuring Power Elevation, Tilting and Rotation. Capacities to 21,000 lbs.



Model D Gear Driven Positioners Compact, Precise, Rugged. Capacities to 1000 lbs.

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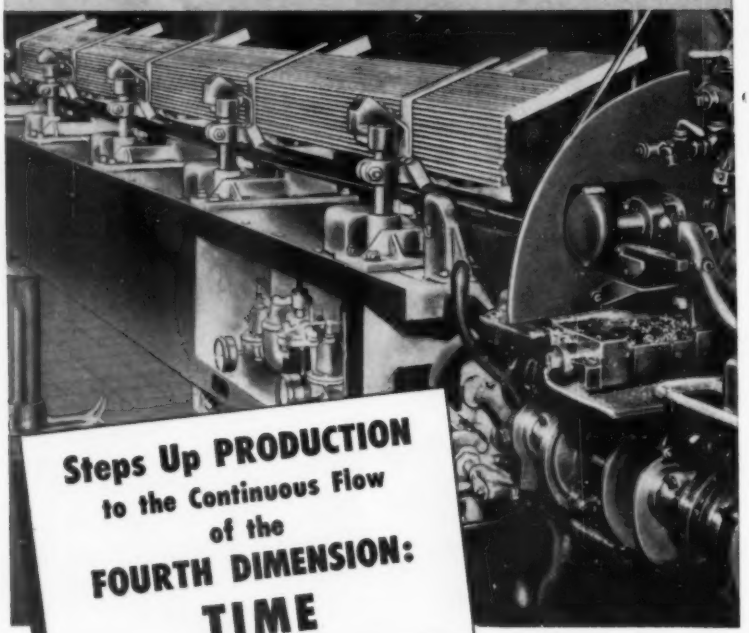

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Metron Instrument Co., 432 Lincoln St., Denver 3, Colo. **T-3-3121**

## Automatic Loader for Lathe

An hydraulically actuated automatic loading mechanism has been developed for the recently announced Model 21 Mona-Matic lathe. Rough workpieces are held in a gravity chute and a shuttle conveyor incorporated into the unit. The loader automatically positions each of the workpieces between the work centers of the machine, triggers the Multicycle Programmer controlled four-cut automatic work cycle of the lathe, and finally removes each finished piece from the lathe when the desired cuts are completed.

No manual control by the operator is required for any portion of the operating sequence once the machine is set in motion. The loading mechanism and the lathe function continuously as long as a supply of new workpieces is maintained in the loader's conveyor chute.

The Mona-Matic lathe used with the new automatic loader mechanism is a standard Monarch Model 21, described in detail in the October issue of THE TOOL ENGINEER. An air-operated tailstock unit is connected to and actuated by the loader control circuit. Special safety switches are incorporated in the tailstock to prevent lathe operation if the workpiece is not properly centered by the loader mechanism. An air-operated chuck is also utilized during the automatic positioning and removal of workpieces, with actuation of the chuck also regulated by the loader's control equipment.

The Monarch Machine Tool Co., Sidney, Ohio.

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# abstracts of FOREIGN LITERATURE

By M. Kronenberg
Consulting Engineer

## Grinding Research

Chip formation in grinding cannot be observed as readily as in other metal-cutting operations because the grinding chips are removed at high speed. Also, they are often invisible to the operator, being covered by the grinding wheel, according to E. Salje, writing in the November 1955 issue of *Werkstattstechnik und Maschinenbau*.

Metal removal per minute in grinding is independent of the speed of the grinding wheel, but affected by the depth of cut, the longitudinal feed and the speed of the workpiece.

The author has made high-speed camera movies and observed the way the individual grain dulls under cut. It only occasionally breaks out, contrary to general belief which assumes that the breaking of the grain structure is mostly responsible for the exposure of new and fresh grains in the cutting process. Chips often stick in the voids in the grinding wheel but also, are often removed at the high speed of the wheel.

This research was substantially concerned with the influence of the grinding wheel on the grinding process. The author has measured the wear of the wheel, the surface finish produced, vibration affects and other similar items. Wear was measured by cutting a groove of 0.0004 inch depth into the outside surface of the wheel by means of a diamond and using this indentation as a reference surface for measuring. Feeding a thin piece of sheet metal radially into the grinding wheel produces a duplicate surface showing the contour of the grinding wheel at any desired instant and permits determination of wear. In the United States, setups with strain gages are used for measuring wheel wear.

The mean distance of the grains of the wheel increased with the number of workpieces produced and was measured by the Goedeke method of duplication. Grains loosened by the truing of the wheel were torn out, others got

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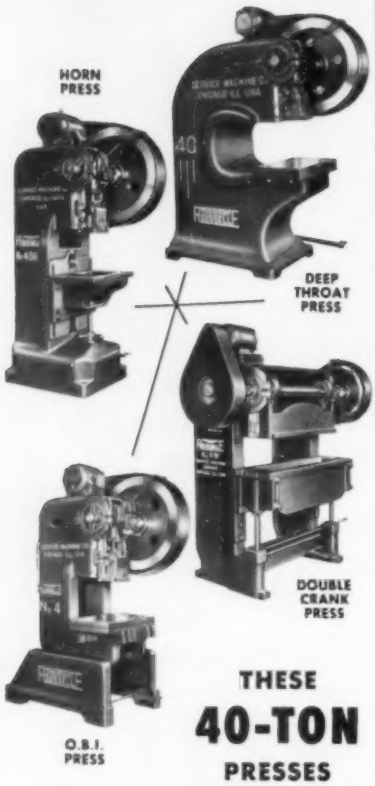


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dull. The number of grains participating in the metal removal decreased with the increase in pieces ground, and is approximately inversely proportional to the mean grain space. The feed per grain increases with the grain space and surface roughness likewise increases with the grain space. The amount of metal removed in a given interval of time remained constant, indicating that the chip per grain has increased.

The author reports that kilowatt consumption rose to a maximum after a certain number of workpieces had been ground but remained constant thereafter; he is not yet in a position to offer an explanation for this finding, but claims that his tests have proved that measuring kilowatt consumption is no reliable criterion for judging the condition of the grinding wheel.

Deflection of the grinding wheel spindle, caused by the grinding forces, throws the wheel out of alignment with the axis of the workpiece and causes the wheel to run at an angle. Feed marks on the workpiece are more pronounced when this happens and it was found that the wheel wears faster on the side nearer to the spindle bearing.

Specific wear, which is the ratio of the volume of the metal removed to the volume of material removed from the grinding wheel, remains almost constant when grinding chromium-nickel steel, but it increases considerably with the number of pieces produced when grinding high-temperature alloys.

The article also deals with a discussion of tool life criteria for grinding wheels and compares several definitions taking into account the surface finish produced and wear of the wheel.

### Diamond Tools

Freedom from vibration in the speed and feed drive and proper tool design are of prime importance for the successful application of diamond tools, according to a report by P. Grodzinski, in the same issue of *Werkstattstechnik und Maschinenbau* mentioned previously.

Diamond tools permit the highest cutting speeds although overlapping exists with carbide tools in certain cases. The author recommends the use of diamond tools in precision work in preference to carbide tools due to the fact that diamonds give a better tool life at the overlapping cutting speeds. The author suggests the use of machines without gears and recommends endless belts for driving the workpiece spindle directly by contact rather than by a sheave or pulley. He shows some illustrations of an endless belt running between two disks and brought into frictional contact with the work spindle, similar to the arrangement of some vibration balanc-


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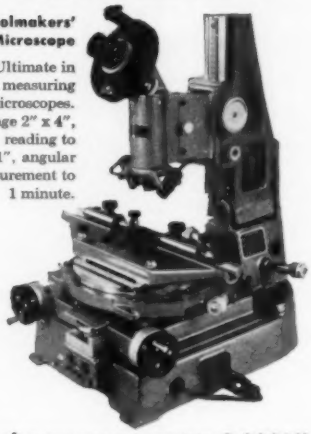

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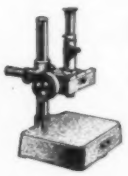

**Micrometer Slide Comparator**

Reliable, low cost instrument for linear measurement. Ranges up to 4", reading to 0.0001" or 0.00005".

**Scale Micrometer or Shop Microscope**

High quality, low cost instrument with range up to 0.100". Reading to 0.001", easy interpolation to 0.0002".

**Write for Bulletin 161-54 showing applications, models, specifications.**

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1241 Wrightwood Ave., Chicago 14, Ill.
Telephone: BUckingham 1-5335

INDICATE A-3-314-2

ing machines, and thus driving the workpiece.

Tool geometry of diamond tools should be carefully studied before application. Structure of the diamond should be taken into consideration since it is a cubic crystal with varying degrees of hardness in its different planes. Life of diamond tools is less affected by gradual wear than by breakdown of the cutting edge. This starts with small fragments, which when allowed to build up, may develop worn areas shaped like scallops and require considerable time for reconditioning.

Surface finish obtained varies considerably from about 0.0001 inch to as much as 0.0040 inch. In the latter case, it is the better tool life, according to the author, which makes the use of diamond tools economical.

### Carbide Tools for Precision Work

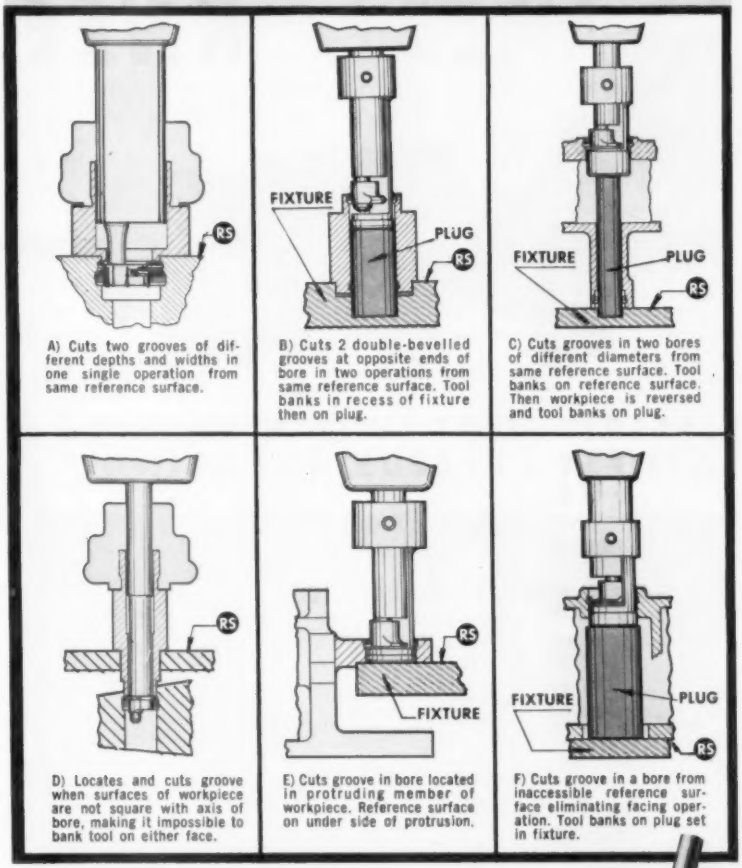
A report by J. Witthoff covering practical data on the use of carbide tools for precision work is published in Issue No. 11, 1955 of *Werkstattstechnik und Maschinenbau*.

Examples refer primarily to turning and boring operations, but include also some broaching data. As a precision turning tool, the author recommends a tool geometry similar to that of a diamond tool; namely, with two side cutting edge angles, known as lead angles in many shops, one of 70 deg and the other of 20 deg.

Recommendations are presented in tabular form for boring operations on horizontal boring mills, vertical boring mills and lathes. These operations cover precision machining of piston rods, bearings, rotors and other parts. The recommended depth of cut is usually in the neighborhood of 0.008 inch, while the feed varies between 0.002 and 0.004 ipr. Recommended cutting speeds cover a range from 330 to 600 fpm for various alloyed steels and up to 1000 fpm for bronze bushings. Tool angles vary between negative 7 deg and plus 15 deg for the true rake. The negative rake angle is recommended for machining cams in interrupted cuts on a particular horizontal boring mill, but not for interrupted cut on a horizontal boring mill of another make. It seems that the deflections of the machines enter here. The use of coolants is recommended for fine machining operations with carbides. The author, who is connected with one of the leading European carbide manufacturers, explains that the tiny chips permit a good cooling effect.

A cost comparison is also included, indicating that precision machining with carbides is about five times as expensive as conventional cutting with carbide tools. All items affecting cost increase in this proportion, namely tool cost, machining cost, and overhead.


**Even Unskilled Labor Can Use This Versatile Tool Accurately! It Simplifies Internal Grooving Problems, Cuts Production Costs!**




A) Cuts two grooves of different depths and widths in one single operation from same reference surface.

B) Cuts 2 double-bevelled grooves at opposite ends of bore in two operations from same reference surface. Tool banks in recess of fixture then on plug.

C) Cuts grooves in two bores of different diameters from same reference surface. Tool banks on reference surface. Then workpiece is reversed and tool banks on plug.

D) Locates and cuts groove when surfaces of workpiece are not square with axis of bore, making it impossible to bank tool on either face.

E) Cuts groove in bore located in protruding member of workpiece. Reference surface on under side of protrusion.

F) Cuts groove in a bore from inaccessible reference surface eliminating facing operation. Tool banks on plug set in fixture.

**Amazingly versatile!** Your toughest recess cutting problems can be met simply and efficiently with the Waldes Truarc Grooving Tool because it offers a whole range of possibilities beyond the range of ordinary recessing tools.

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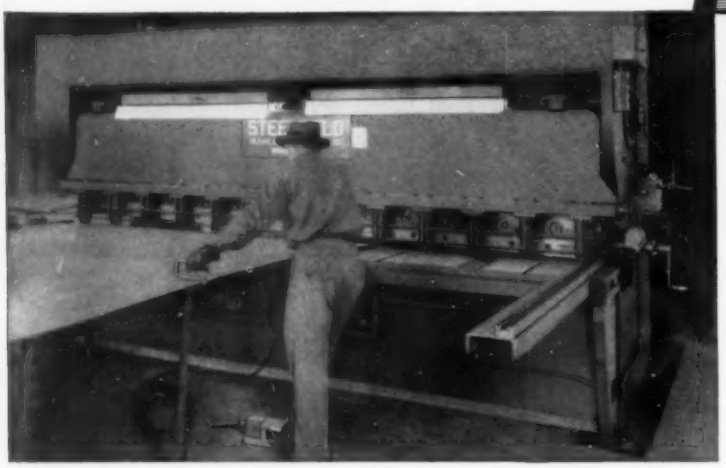
# TOE CONTROL ELIMINATES KNEE ACTION

## ELECTRIC FOOT SWITCH REDUCES FATIGUE - SPEEDS SHEARING



● The operator can slide the switch around the floor to wherever handiest to use. A mere touch of the toe and the knife is set in motion. Electric toe control is standard on all Steelweld Shears and furnished at no extra cost. It enables shearing speeds not attainable with ordinary foot treadles for many cutting operations.

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**STEELWELD PIVOTED BLADE SHEARS**

# TRADE literature

### Leveler

Four-page bulletin, No. 41, describes how Voss leveler accurately flattens sheet, strip or stamped parts of ferrous or nonferrous metals. E. W. Bliss Co., Rolling Mill Div., Salem, Ohio. **L-3-1**

### V-Belts

Four-page data sheet on Multi-V Belts featuring Grommet construction. Information is given on standard, high-capacity, static-conducting, oil-resisting and double V-belts. B. F. Goodrich Co., Industrial Products Div., Akron, Ohio. **L-3-2**

### Cylinder Block Machining

Twelve-page catalog, "Automatic Progress-Thru Machines for Processing Cylinder Blocks," shows examples of multiple-spindle transfer machines used in processing cylinder blocks. Operations are completely described. W. F. & John Barnes Co., Dept. CB, 301 S. Water St., Rockford, Ill. **L-3-3**

### Stainless Fasteners

First edition of a semi-annual catalog on stainless steel fasteners contains information on more than 9000 items in 64 pages. It combines stock list, price list and discount sheet in one manual. A visual index increases utility of this catalog. Anti-Corrosive Metal Products Co., Inc., Castleton-on-Hudson, N. Y. **L-3-4**

### Turret Drills

Four-page brochure gives basic information on five types of Burgmaster turret drills and illustrates models of Tool-flex full-floating toolholders. Burg Tool Mfg. Co., Inc., 15001 S. Figueroa St., Gardena, Calif. **L-3-5**

### Limit Switches

Bulletin No. 33 gives four pages of information on a precise mechanical rotary limit switch that electrically controls stops, starts, interlocks, motion, time, sequence and recycles of machine tools and mechanical press auxiliary equipment. E. W. Bliss Co., Canton, Ohio. **L-3-6**

### Plastic Film

Methods of using Reynolon PVA/4-6 Series Polyvinyl Alcohol plastic film in vacuum bag molding of plastic parts are described in a four-page brochure. Complete technical data on properties and characteristics are given on this film and Reylease, a mold release parting solution. Reynolds Metals Co., 2500 S. Third St., Louisville 1, Ky. **L-3-7**

### Stationary Tachometers

Bulletin No. 105, four pages, presents information on a line of tachometers with new circuits and new take-off heads that increase service life by five times. Possible combinations of indicators and take-off heads are shown. Metron Instrument Co., 432 Lincoln St., Denver, Colo. **L-3-8**

### Heat Treating

Catalog of descriptive fact sheets, 17 pages, gives details on S&W heat treating furnaces and atmosphere generators, both electric and fuel fired. Specifications, advantages and features are listed. Sargeant & Wilbur, Inc., 180 Weeden St., Pawtucket, R. I. **L-3-9**

### Polyester Film

Eight-page Booklet MB-4 has chart detailing characteristics of Mylar polyester film. A table gives list of all available types and gages. Typical uses are described. E. I. duPont de Nemours & Co., Film Dept., Wilmington 98, Del. **L-3-10**

### Flexible Exhaust Hose

Five-page Bulletin 50 describes Flexaust hose and Portovent duct and how they are used in the metalworking industry. Information is included on application of these products to grinders, polishers, buffers and cut-offs. The Flexaust Co., 100 Park Ave., New 17, N. Y. **L-3-11**

### Gears

Description of facilities for cutting gears to specifications is presented in Bulletin No. AC 503, 8 pages. Sargent Engineering Corp., 2533 E. 56 St., Huntington Park, Calif. **L-3-12**

### Adhesives

A new one-page data chart covering 30 adhesive formulations for bonding plastics and metals is available from Dept. P, Rubber & Asbestos Corp., 225 Belleville Ave., Bloomfield, N. J. **L-3-13**

### Small Clutches and Brakes

Eight-page Catalog No. 955 covers a standard line of miniature magnetic clutches and brakes. Seven types, in two sizes each, are described with complete operating characteristics. Dial Products Co., 9 Avenue E, Bayonne, N. J. **L-3-14**

### Testing Corrugated Boxes

Designed to show techniques of package testing, "How To Test Corrugated Boxes" is a 24-page booklet that offers a comprehensive check-list by which to judge protective qualities and general efficiency of specific corrugated boxes. Hinde & Dauch, Sandusky, Ohio. **L-3-15**

### Anodizing Dyes

Colors for anodized aluminum that resist fading from sunlight and outdoor exposure are shown in this brochure, which also describes anodizing, dyeing and sealing procedures followed for maximum light fastness. Sandoz Chemical Works, 61 Van Dam St., New York 13, N .Y. **L-3-16**

### Accordion Sleeves

Drawings illustrating the commonly accepted methods for installing pliable sleeves and way-protectors are contained in one-page Bulletin MIS-56. A & A Mfg. Co. Inc., 2017 W. Clybourn St., Milwaukee 3, Wis. **L-3-17**

### Wire Thread Inserts

Revised "Design Manual and Catalog," No. 652A, presents design data on stainless steel and phosphor bronze wire thread inserts, in 22 pages. Separate sections in the catalog are devoted to inserts for automotive and aviation spark plug threads and pipe threads. A separate bulletin (No. 689A) is

available as a supplement to No. 652A, and gives military standards for drilling depth, class of fit, gages and similar items. Heli-Coil Corp., Danbury, Conn. **L-3-18**

### Pneumatic Pressure Controller

A pressure controller, available in ranges from 0-50 to 0-200 psi, with "on-off" or "10% Throttler" control, is described in a two-page brochure, Bulletin 7040. Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Aves., Philadelphia 44, Penna. **L-3-19**

### Coordinate Boring and Milling Machine

A new 12-page catalog on a coordinate boring and milling machine with fully automatic precision spindle positioning is available from the Marac Machinery Corp., 45 S. Broadway, Yonkers, N. Y. **L-3-20**

### Finishing Systems

Completely engineered finishing systems are described in a 16-page bulletin, No. 51. The examples shown indicate how metal finishing systems can be designed to achieve good finish, low cost, high production and smooth operation. Despatch Oven Co., 619 Eighth St., S.E., Minneapolis 14, Minn. **L-3-21**

### Air Filter

Two-page brochure describes a fully automatic lightweight aluminum air filter which can be quickly attached to any air tool. Hand draining is not required. Catalog number 1156. Emco Pneumatic Corp., 1317-1319 Locust St., Des Moines, Iowa. **L-3-22**

### Portable Air Tools

Bulletin No. 53, 8 pages, gives characteristics and specifications on a complete line of portable air assembly tools, drills, small-wheel, straight and vertical grinders, and scalers, chippers and rammers. The Rotor Tool Co., 26300 Lakeland Boulevard, Cleveland 32, Ohio. **L-3-23**

### Buffs

Illustrated 12-page bulletin describes the three different types of buffs used in cutting down and coloring: pieced buffs, for light work; full-disk buffs, for light and medium duty; and ruffled buffs, for heavy duty. Methods of sewing are explained and illustrated. Information on grades of cloth, ruffle patterns, diameter sizes, hole sizes and flange designs is given in detail. Bulletin No. B-103. Hanson-Van Winkle-Munning Co., Matawan, N. J. **L-3-24**

### High Pressure Lubricator

Four-page brochure describes high pressure automatic lubricators applicable to printing presses, machine tools, packaging, labeling and bottling machines, and other types of machinery. Two basic types, one for frequent cycling and one for infrequent cycling are discussed in terms of feed requirements for specific machines. Reservoirs, oil filters and single feed line distribution systems are also described. Bulletin 3A. Bijur Lubricating Corp., Rochelle Park, N. J. **L-3-25**

### Clutches

A line of ventilated clutches, designed for heavy-duty service, is described in Bulletin ML-102A, eight pages. Fawick Airflex Div., Fawick Corp., 9919 Clinton Rd., Cleveland 11, Ohio. **L-3-26**

### Rotary Air Seal and Cycle Timer

Details on a combination rotary air seal and cycle timer for air-operated presses are contained in Bulletin ML-135, four pages. Fawick Airflex Div., Fawick Corp., 9919 Clinton Rd., Cleveland 11, Ohio. **L-3-27**

### Punches

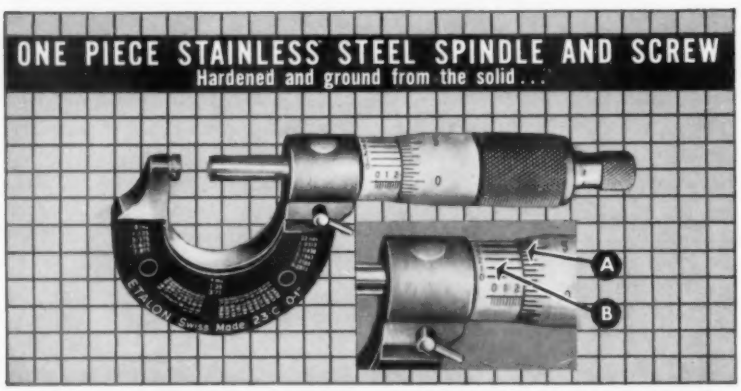
Two series of perforating units for press and press brake set-ups are described in a new catalog. The units can punch round or shaped holes in sheets or angles up to ¼ inch thick. Punch Products Corp., 3800 Highland Ave., Niagara Falls, N. Y. **L-3-28**

### Serrated Tools

Twenty-one different serrated tools are illustrated in a new brochure, which also lists the various sizes that fit different makes of drivers, wrenches and drive adapters. Bergander Mfg. Co., 2129 Warner Ave., Chicago 18, Ill. **L-3-29**

### Shaft Mounted Reducers

Details on a line of Cone-Drive shaft-mounted reducers which utilize the double-enveloping worm gear design are given in a new 12-page booklet.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A—Half-thousandth graduations on thimble allow tenths readings with only 5 Vernier graduations.

B—Deep machine divided graduations on both thimble and barrel assure easy reading.

**• Reads to .0001" • Forged frame • Heavy duty tungsten carbide measuring faces, optically lapped • Quick acting positive lock • Feather touch friction stop assures senstive feel • Dull chrome finish on thimble and barrel eliminates glare • Built for accuracy under the most rugged applications • In handsome contour case.**

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**401 Broadway, New York 13, N. Y.**
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Dimensioned assembly drawings, power and torque rating charts are included, as are complete specifications on bore sizes and gear mountings plus mounting instructions. Bulletin CD-400. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. **L-3-30**

### Variable-Speed Drives

Information on a line of variable-speed drives and their application is contained in an 8-page brochure. Sterling Electric Motors, Inc., 5401 Telegraph Rd., Los Angeles 22, Calif. **L-3-31**

### Free-Machining Steel

Twenty-page brochure gives data, characteristics and properties of Fatigue-Proof, high-strength free-machining steel bar. La Salle Steel Co., Chicago 80, Ill. **L-3-32**

### Carbide Tools

Data on carbide-tipped tools in general, and charts and descriptions of various sizes and styles of standard and special carbide tipped tools, are contained in a new 12-page catalog. Besly-Metro Div., Besly-Welles Corp., Beloit, Wis. **L-3-33**

### Adhesives, Coatings and Sealers

Typical applications for adhesives, coatings and sealers are listed in the comprehensive tables contained in a new 12-page catalog. Adhesives and Coatings Div., Minnesota Mining and Mfg. Co., 411 Piquette Ave., Detroit 2, Mich. **L-3-34**

### Plastic Dies

The manufacture, uses and advantages of plastic draw dies, stretch press dies and hydro-form dies are described in a new collection of "Metal Forming Bulletins." Marblette Corp., 37-21 Thirtieth St., Long Island City 1, N. Y. **L-3-35**

### Fractional Horsepower Motors

A 12-page publication describing a line of fractional horsepower motors for direct application and built-in use has been released. Bulletin GEA-6068. General Electric Co., Schenectady 5, N .Y. **L-3-36**

### Electrolytic Shaping

A six-page technical bulletin, No. 156, covering the use of electrolytic grinding methods for shaping honeycomb materials is available from the Anocut Engineering Co., 631 W. Washington St., Chicago 6, Ill. **L-3-37**

### Tracing Templates

Forty-eight 8½ x 11 full size tracing templates for strap clamp assemblies, malleable and aluminum hand knobs, speed handles, speed bar knobs, and revolving and swing clamp assemblies are contained in a new portfolio, which also includes a chart of formulas for finding functions of angles, and a chart showing decimal equivalents of standard drill sizes. Free to designers and draftsmen on request on company letterhead. Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland, Ohio.

### Electric Weld Tube Mills

The fifth revised edition of a 64-page illustrated book on the electric-weld process of tube manufacture is now available. The book contains a brief review of the different tube making

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DEBURR HOLES.
ULTRA-FINISH
HOLES AND SURFACES.
CHAMFER HOLES.
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For removing burrs from round holes through two or more surfaces without reversing your part.
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processes and a complete description of the cold-forming, electric-weld process. The book also contains specifications and illustrations of the different units comprising complete mills. The Yoder Co., Cleveland 2 Ohio. **L-3-38**

### Stainless Steel

PL203 is a 54-page booklet giving adjusted base prices that apply on cold-finished stainless steel wire ½ inch in diameter and under, and on stainless steel hot-rolled wire rods. New extras are included to cover finishing costs on cold-finished bars and wire. Crucible Steel Company of America, Oliver Bldg., Pittsburgh 22, Pa. **L-3-39**

### Steel Shot

Performance data on cast steel, heat treated blast cleaning and peening abrasive shot is given in the 8-page Bulletin No. 89-B. Shot sizes are shown and there is a discussion of the factors important to economical and efficient use of abrasives. Wheelabrator Corp., 1182 S. Byrkit St., Mishawaka, Ind. **L-3-40**

### Deep-Throat Presses

Twenty-six-page Bulletin 61C describes a new line of deep-throat presses. Specifications are given for presses ranging from 22 to 150 tons capacity. Niagara Machine Tool Works, 683 Northland Ave., Buffalo 11, N. Y. **L-3-41**

### Cutting Tools

Thirty-two-page Price List B gives specifications on Diamonite, synthetic sapphire substance in bond, turning and cutting tools and blanks. Hints for using this material are also given. Diamonite Products Div., United States Ceramic Tile Co., 217 Fourth St., N.E., Canton 2, Ohio. **L-3-42**

### Gas Carburizing

Eight-page booklet describes furnace equipment for gas carburizing, both continuous and batch processes. Surface Combustion Corp., Toledo 1, Ohio. **L-3-43**

### Vertical Automatic Lathe

A vertical automatic production lathe, available in 5 to 25 hp capacities, is described in a six-page illustrated circular. Sundstrand Machine Tool Co., 2531 Eleventh St., Rockford, Ill. **L-3-44**

### Shuttle-Drive Conveyor

Four-page bulletin gives complete technical details on a new type oscillating conveyor for chip disposal and similar material handling applications. Dept. SD-298, Industrial Filtration Co., Lebanon, Ind. **L-3-45**

### Stainless Steel Fastenings

A complete line of stainless steel fastenings available from stock is described in a 24-page catalog, No. 55A. Star Stainless Screw Co., Dept. TL, 699 Union Blvd., Paterson 2, N. J. **L-3-46**

### Hydraulic Valves

A line of solenoid-controlled panel-mounted hydraulic valves is described in Catalog 261, 8 pages. Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Mass. **L-3-47**

### Gages

New 112-page catalog covers cylindrical plug gages, taper gages and master setting disks, cylindrical ring gages, adjustable limit gages, thread gages, thread production and checking equipment, and pipe thread gages.

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DELUXE MODEL SOLID TUNGSTEN
CARBIDE DRILL JIG BUSHING
BUY ACME CARBIDE BUSHINGS...
1. wears 50-times longer
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Manufacturers of standard steel drill jig bushings, dowel pins, chamfer micrometer gauges, portable bench centers, roughness comparison specimens, hardened and ground parts and assembly to order.

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Forty pages of engineering data are included in a separate section. Threadwell Tap & Die Co., Greenfield, Mass.
L-3-48

### Vibration Dampener

An elastic material intended to provide vibration isolation for machines is described in 4-page Catalog No. IS-55. T. R. Finn & Co. Inc., Industrial Div., 200 Central Ave., Hawthorne, N. J.
L-3-49

### Air Cylinders

Complete engineering drawings and specifications are included on five types of interchangeable mountings and a line of heavy-duty air cylinders in this 12-page catalog. Petch Mfg. Co., 463 York, Detroit 2, Mich. L-3-50

### Vibration Hangers

Catalog No. VH-55, 4 pages, describes a line of high-deflection heavy-duty vibration hangers designed to prevent transmission of noise and vibration of suspended equipment. Installation instructions are included. T. R. Finn & Co., Inc., Industrial Div., 200 Central Ave., Hawthorne, N. J.
L-3-51

### Air-Operated Equipment

Air cylinders, valves, clamps and dial feed indexing tables are featured in a new 40-page catalog. A. K. Allen Co., 57 Meserole Ave., Brooklyn 22, N. Y. L-3-52

### Aircraft Steels

Condensed information on Army, Navy and Government aircraft steel specifications is given in a 68-page booklet. Joseph T. Ryerson & Son, Inc., Box 8000-A, Chicago 80, Ill.
L-3-53

### Deep-Hole Drilling

Quill type hydraulic power units and their use in drilling deep holes are covered in 20-page Bulletin 45352. Drills are cycled to feed a predetermined distance then withdraw to clear chips. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. L-3-54

### Ratchet-Operated Puller

Six-page Bulletin 146-G describes device available in ¾ to 6 ton capacities. Chisholm-Moore Hoist Div., Columbus McKinnon Chain Corp., Tonawanda, N. Y. L-3-55

**Need rivets of AL, FE, NI, or CU?**

*Milford makes rivets from a wide variety of metals, alloys, platings and finishes!*

Any wire material that can be cold-formed can be manufactured into a wide variety of precision rivets by Milford.

Semi-tubular, full-tubular, bifurcated, cutlery, special decorative rivets—Milford cold-forms them all. It's Milford cold-forming that makes possible the low cost, excellent finish and inherent strength of both Milford Rivets and the finished product.

To cut delivery time and production costs, to improve product appearance, to assemble your product on automatic rivet-setting machines—get in touch with Milford!

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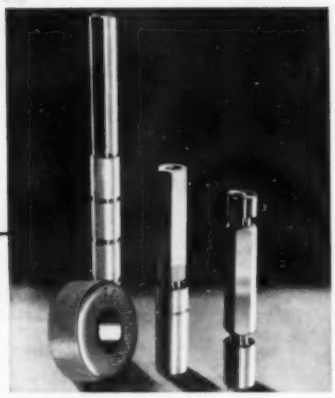
# who's meeting and where

**Mar. 8-9.** The Society of the Plastics Industry Canada, Inc. 14th annual Canadian conference, Sheraton-Brock Hotel, Niagara Falls, Ont., Can. More information may be had from The Society of the Plastics Industry, Inc., 67 W. 44th St., New York 36, N. Y.

**Mar. 14-16.** American Society of Mechanical Engineers. Aviation Division conference. Beverly-Hilton Hotel, Los Angeles, Calif. Direct inquiries to Southern California Section of ASME, c/o Lynn-Western, Inc., 6901 Melrose Ave., Los Angeles 38, Calif.

**Mar. 14-16.** Pressed Metal Institute. Annual spring technical meeting, Hotel Carter, Cleveland, Ohio. For more information, contact H. A. Daschner, managing director of the institute, 3673 Lee Rd., Cleveland 20, Ohio.

Don't Scrap Your Worn Gages



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**Will Salvage Them By Hard Chrome Plating or Carb-O-Plating**

When your gages have apparently outlived their usefulness, then is the time to send them to Lincoln Park for salvaging.

Two methods are used—either hard chrome plating or Carb-O-Plating. In the chrome plating process, the gages are carefully prepared for plating, are hard chrome plated, and then finished. When Carb-O-Plating is employed, a thin wear-resistant coating of tungsten carbide is applied over the steel base. This coating has approximately the same properties as sintered carbide—92% tungsten carbide and 8% cobalt.

In both cases, the gages are not only restored to exact size and tolerances, but provide a wear life far in excess of that of the original gages. If you're looking for new ways to cut inspection costs, it will pay you to investigate Lincoln Park's salvaging processes. Let us send you full information.

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**Mar. 19-20.** Steel Founders' Society of America. Annual meeting, Drake Hotel, Chicago, Ill. Complete facts may be obtained from society offices, 606 Terminal Tower, Cleveland 13, O.

**Mar. 19-21.** Society of Automotive Engineers, Inc. National production meeting and forum, Hotel Statler, Cleveland, Ohio. More information may be had by writing society offices, 29 W. 39th St., New York 18, N. Y.

**Mar. 19-23.** American Society of Tool Engineers, Industrial Exposition. International Amphitheatre, to be held coincidentally with the annual meeting. Conrad Hilton Hotel, Chicago, Ill. Complete details are available from Society offices, 10700 Puritan Ave., Detroit 38, Mich.

**Mar. 27-Apr. 2.** The Society of the Plastics Industry. 13th annual Pacific Coast section conference, St. Francis Hotel, San Francisco, Calif., and S.S. Lurline to Honolulu. Details are available from society office, 67 W. 44th St., New York 36, N. Y.

**Apr. 10-12.** Metal Powder Association. 12th annual meeting and 1956 Metal Powder Show, Hotel Cleveland, Cleveland, Ohio. Additional information is available from association office, 420 Lexington Ave., New York, N. Y.

**Apr. 18-20.** Armour Research Foundation of Illinois Institute of Technology. National industrial research conference, to be held as part of Foundation's 20th anniversary. Further details may be obtained from Institute, 35 W. 33rd St., Technology Center, Chicago 16, Ill.

**Apr. 21.** State University of Iowa and American Society of Tool Engineers in conjunction with ASME, AIIE, IEAI and other Iowa and Western Illinois organizations are sponsoring the second annual Engineers-Management Conference. More details may be gained from the university's School of Engineering, Iowa City, Iowa.

**May 3-9.** American Foundrymen's Society. 60th annual foundry congress and exhibit. Convention Hall, Atlantic City, N. J. For further facts, contact

society headquarters, Golf & Wolf Rds., Des Plaines, Ill.

**May 4.** The Ohio State University, College of Engineering. Annual conference for engineers. Get further information from Assoc. Dean Harold A. Bolz, College of Engineering, The Ohio State University, Columbus 10, Ohio.

**May 9-11.** American Welding Society. National spring meeting, and fourth Welding & Allied Industry Exposition, Buffalo, N. Y. Definite data is available from society headquarters, 33 W. 39th St., New York 18, N. Y.

**May 14-17.** Design Engineering Show. First of annual shows to be devoted to original equipment which goes into manufacture of finished products. Convention Hall, Philadelphia, Pa. Contact exposition managers, Slapp & Poliak, Inc., 341 Madison Ave., New York, N. Y.

**June 3-8.** Society of Automotive Engineers, Inc. Summer meeting. Chalfonte-Haddon Hall, Atlantic City, N. J. More facts are available from society office, 29 W. 39th St., New York 18, N. Y.

**June 5-7.** The Material Handling Institute, Inc. Technical sessions and Exposition, Cleveland Auditorium, Cleveland, Ohio. Complete facts may be obtained from institute office, Room 759, One Gateway Center, Pittsburgh 22, Pa.

**June 11-15.** The Society of the Plastics Industry, Inc. 7th National Plastics Exposition, New Coliseum, New York, N. Y. Request further facts from society headquarters, 67 W. 44th St., New York 36, N. Y.

**June 17-21.** American Electroplaters Society. 43rd annual convention. Hotel Statler, Washington, D. C. Full information may be had from society office, 445 Broad St., Newark 2, N. J.

**June 17-22.** American Society for Testing Materials. 59th annual meeting and 12th apparatus exhibit, Chalfonte-Haddon Hall, Atlantic City, N. J. Write for particulars to society headquarters, 1916 Race St., Philadelphia 3, Pa.


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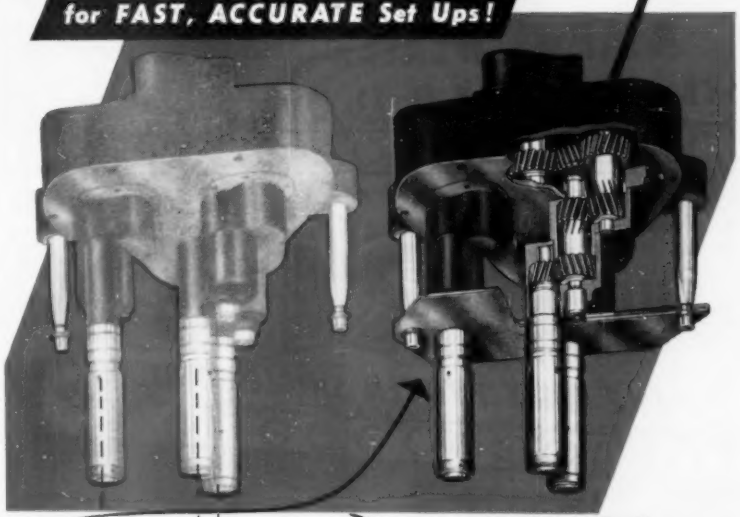
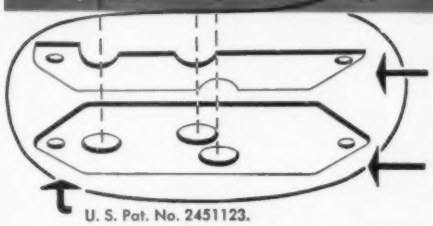
**Have Spindle Positioning Plates for FAST, ACCURATE Set Ups!**





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Swing each spindle into half-holes of positioning plate for exact location.

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Slip on full-hole template locking spindle in exact position.

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**3. LONG LIFE** — Helical gearing and other moving parts hardened to resist wear.

**4. STANDARD PARTS** — Always in stock.

**5. SIZE AND CAPACITY** — Six models, each in 2 to 8 spindles. Capacity: wire-size thru 1¼" diam. drills; operation to 4000 r.p.m.

**6. GUARANTEE** — WISCONSIN products are backed by a full year guarantee against defective materials and workmanship.

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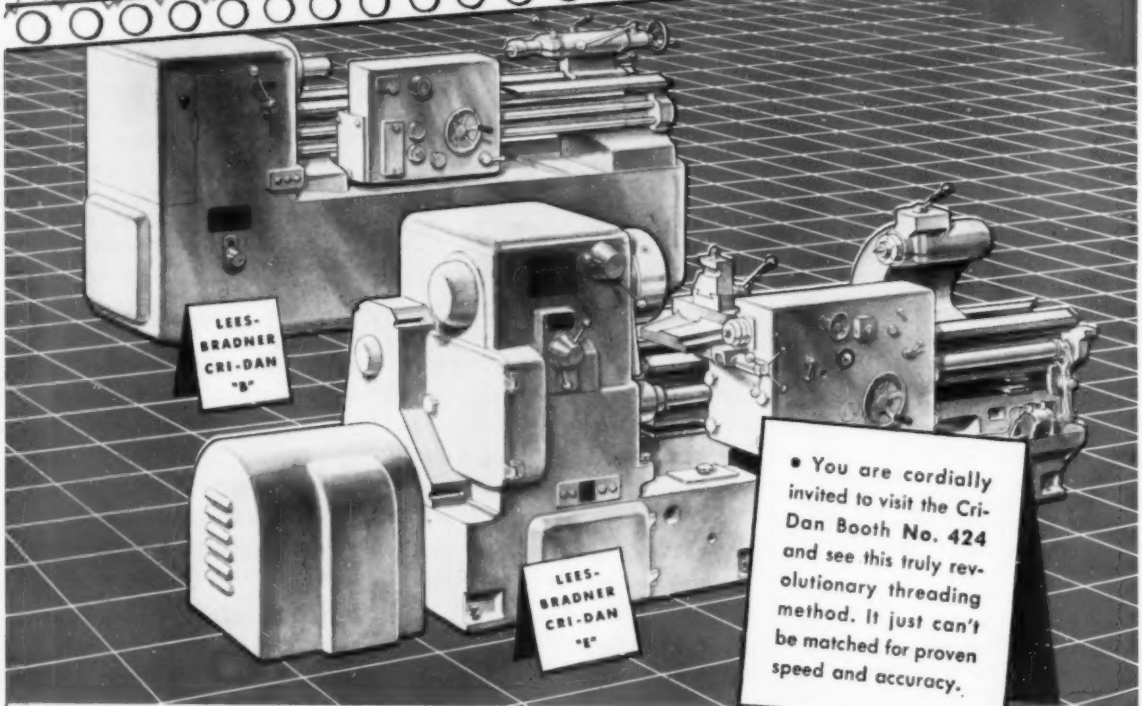


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# Men at Work

**George A. Delaney,** chief engineer of GM's Pontiac Motor Div. recently took office as 1956 president of the Society of Automotive Engineers. He succeeds C. G. A. Rosen, 1955 SAE President.

A graduate of the University of Missouri, he joined the old Paige-Detroit Motor Car Co. in Detroit as a trouble-shooter and became assistant chief engineer.

Delaney joined Pontiac as electrical engineer in 1934, became assistant chief engineer in 1939, and chief engineer in 1946. During World War II he supervised aircraft engine engineering at GM's Fisher Body Div.

Appointment of a director of the Research and Development Div. of The Carborundum Co. has been announced. He is **Leslie E. Simon,** Major General, U. S. Army, retired, formerly Assistant Chief of Ordnance for research and development of the U. S. Army Ordnance Corps. Major General Simon is recognized in the military and industrial world for many of the more than 400 new items developed during his administration of Army Research and Development since 1949. Some of these projects are the "Nike" anti-aircraft guided missile system, the 280-mm atomic cannon, the Corporal guided missile and the Honest John rocket.

Formerly director of operations of the A.E.C. plutonium plant in the state of Washington, **Donald G. Sturges** has been appointed manager of the new products branch of the Research and Dev. Div. of The Carborundum Co.

As director of operations at the A.E.C.'s billion-dollar plutonium plant on the Columbia River, Sturges was responsible for the administration of all production, research and development, and radiation safety activities. He will supervise the company's development program after the initial stages of research on new products through the pilot plant production phases prior to final production.

**F. H. Mulligan,** a leader in the powder metallurgy field for the past 20 years, has been elected president of Charles Hardy, Inc., it was announced today. He succeeds **John D. Dale** who was elected chairman of the firm's board of directors.

Joining Hardy in 1919, four years after its founding, Mulligan has held a variety of managerial positions prior to election as president. A former director of the Metal Powder Association, Mr. Mulligan was honored in 1951 as one of 35 pioneers of the metal powder industry.

**Raymond G. Mozley** has been named chief applications engineer and **Charles A. Lessing,** formerly of International Harvester Co., has been appointed chief laboratory engineer of Copeland Refrigeration Corp. Mozley has been in charge of laboratory and applications development activities since joining Copeland in January, 1952. Before joining Hussmann, Mozley was associated with P. E. Daubenspeck Inc., a Pontiac, Mich. commercial refrigeration contractor in application and service programs. Lessing most recently was associated with International Harvester in charge of a section of refrigeration product development and engineering laboratory.

Warner & Swasey directors have elected **James C. Hodge** a vice president. Dr. Hodge, formerly of Wellman

**Alfred F. Bauer has been appointed assistant general manager of the Doehler-Jarvis Div. of National Lead Co. Formerly chief engineer of the company, he will continue to function in that capacity. He joined the Dow Chemical Co. in 1948 and came to the Doehler-Jarvis research staff in 1951.**

**John Gabrenas has been appointed chief engineer of Firth-Loach Metals, Inc., McKeesport, Pa. He was previously associated with Firth-Sterling Steel Co. as assistant chief engineer from 1948 to 1955. Prior to that he was tool supervisor for the Douglas Aircraft Co. at Park Ridge, Ill.**

**William R. Toeplitz was recently named president of Bound Brook Oil-Less Bearing Co., Bound Brook, N. J. A graduate of Lehigh University, Mr. Toeplitz majored in metallurgy. He is a member of several engineering societies and regarded as an authority on powder metallurgy.**

**Portland Machine Tool Works, Inc. of South Portland, Me., has announced the appointment of Thomas Pakenham as general manager. Mr. Pakenham will be in charge of the Machine Tool and Heavy Machining Divisions as well as the recently expanded Aircraft Division.**

**A. J. DeWolf was elected president and treasurer of the Dreis & Krump Mfg. Co., Chicago 36, Ill., at a recent special meeting of the board of directors. Mr. DeWolf has been with the company since 1945.**

**Rudolph Hallberg has been named general manager of Lovequist Engineering Co., Los Angeles. A native of Boras, Sweden, Hallberg has held important positions with several leading midwest firms.**

**The board of directors of Crucible Steel Co. of America has elected Maurice J. Day vice president of research and development. He was appointed director of research and development in late 1954.**

**Pettibone Mulliken Corp. announces the appointment of Wade Meloan as a vice president of the corporation, effective Jan. 1, 1956. Mr. Meloan has been with Pettibone Mulliken Corp. since 1943.**


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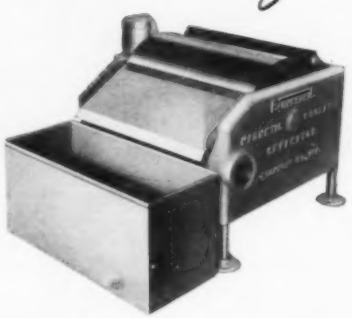

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*Complete data in Bulletin 151G*

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Engineering Co., will be chiefly concerned, for the present, with problems of manufacture in Warner & Swasey's Cleveland, New Philadelphia, Ohio, and Lansing, Michigan plants. Dr. Hodge received his doctorate at the Engineering School of Harvard University.

Square D Co. has named **John D. Leitch** as vice president-engineering and **Alvin C. Dyer** as vice president and general manager of the Electric Controller and Mfg. Co., a division. Both positions are newly created.

A graduate of the University of Glasgow (B.S.), Scotland, and the University of Toronto (Ph.D. in physics), Canada, Dr. Leitch joined Electric Controller in 1937 in charge of product development. He was named chief engineer in 1943 and a vice president in 1952.

Dr. Leitch was earlier associated with the Steel Co. of Canada and was a member of the faculty of the University of Toronto. He is a member of several professional and engineering societies.

**L. B. Kuhns** and **B. J. Fletcher** have been named assistant chief engineers for Aluminum Co. of America. Both men will continue in their present positions—Kuhns as chief construction engineer and Fletcher as chief hydraulic engineer, according to **J. P. Haight,** Alcoa's chief engineer.

**Martin C. Falk** has been appointed chief research engineer for theYoder Co., Cleveland, Ohio. Falk came here from Warren Steel Div. of Copperweld Steel Corp. Since 1936, when he came

to this country from Germany, he has also been with Westinghouse Electric Corp. and Pittsburgh Plate Glass Co.

He is a registered professional engineer in several states and received his E.E. degree at German Technical College, Bingen, Germany.

Crucible Steel Co. of America has appointed **James K. Stanley** supervisor of the company's silicon steels and magnetic materials research section, according to an announcement by Maurice J. Day, vice president of research and development. Prior to his appointment with Crucible, Dr. Stanley was supervisor of metallurgy in the Standard Oil Co. of Indiana's Materials Div. His experience includes research for the National Smelting Co. and magnetics research for the Westinghouse Electric Corp. Dr. Stanley is the author of many technical publications and a member of various professional and engineering societies.

Addition of **Ludlow King** to the staff of the National Machine Tool Builders' Assn. as assistant to **Tell Berna,** its executive vice president, was announced by **Louis Polk,** president of the association.

King, who is a native of Oklahoma, had his early schooling in Washington, D. C., and was graduated from West Point in the class of 1930. Besides a distinguished military career, King has had broad experience in the field of industrial sales and government relations.

**H. E. Thornton** has been appointed chief engineer of the Bound Brook Oil-Less Bearing Co., Bound Brook, N. J. Mr. Thornton has a solid background in engineering, being a licensed professional engineer in the state of New Jersey.

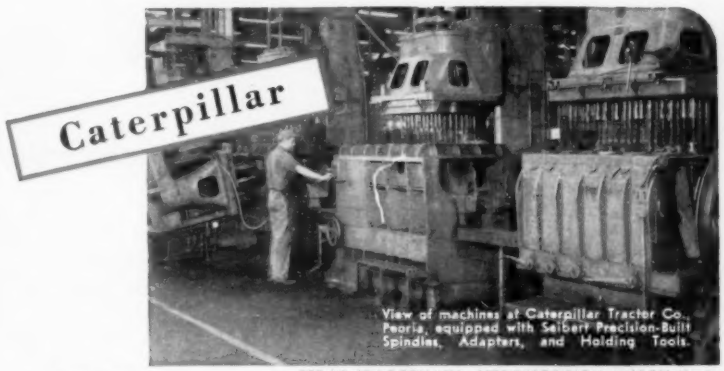
Prior to joining the Bound Brook company in 1945, Thornton spent ten years with the Western Electric Corp. at Kearny, N. J., where he developed a continuous mica-coating process.

**Ernest G. Swigert,** president of Hyster Co., has been elected national vice president of the National Association of Manufacturers. The announcement was made during the NAM's 60th annual Congress of American Industry at New York City. Swigert has served on NAM's board of directors for a number of years and during 1955 served as regional vice president of the organization. In being elected number-two man in the NAM, Swigert becomes the first industrialist from the Northwest to hold such a high post in the 20,000-member association.

**Donald M. Pattison** has been elected vice president of The Motch & Merryweather Machinery Co. with headquarters in the Penton Bldg., Cleveland, Ohio. Having served as director of marketing, Pattison continues to be responsible for those duties also in directing the sales policies of the company. He has been active in the affairs of The National Machine Tool Builders' Association as well as the Machinery and Allied Products Institute.

Titan Metal Mfg Co., Bellefonte, Pa., has announced the promotion of five executives to key positions, effective January 1. Named vice president in charge of manufacturing is **Grey W. Tressler,** formerly works manager; **Marvin J. Rothrock** will be vice president and director of purchases; **Ralph H. Lightner** becomes vice president and sales manager; **H. Chapman Ward** will be vice president and cost controller; and **W. E. Dunnick** will be works manager.

**J. C. Douglas** has been appointed a vice president of Electro Metallurgical Co., a Div. of Union Carbide and Carbon Corp. Douglas began his association with Union Carbide in 1934. He was born in Augusta, Ga., graduated from Georgia Tech in 1934 in electrical engineering.

View of machines at Caterpillar Tractor Co., Peoria, equipped with Seibert Precision-Built Spindles, Adapters, and Holding Tools.

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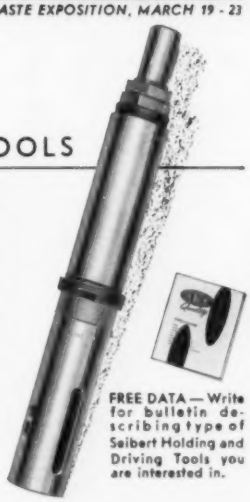

● Like any other reputable manufacturer, large or small, we are especially pleased when the products of our labor are accepted for tests and eventually approved for actual service by a manufacturer or machine tool builder. Yet, being realistic, we know full well this is only the beginning. The acid test comes later, proving our ability to maintain high standards of quality and a constant, dependable service day-in and day-out over a period of years. It is therefore, a source of deep gratitude and satisfaction in that we have, over a period of years, been privileged to serve so many fine companies like Caterpillar Tractor Co. who serve others so well.

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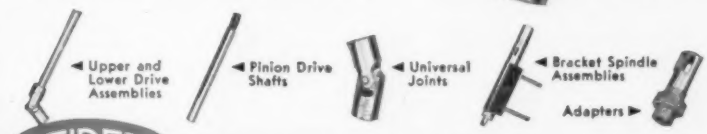


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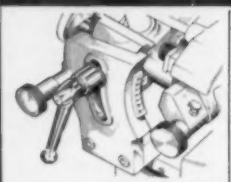
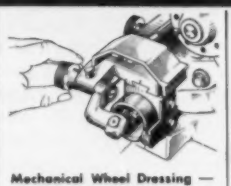
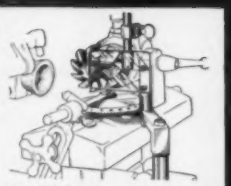


**Clearance Angle Scale** — clearance angles are read directly from a graduated scale on the wheel spindle assembly.



**Mechanical Wheel Dressing** — an accurate radius is mechanically dressed on the grinding wheel in correct relationship to self-registering tooth rests.



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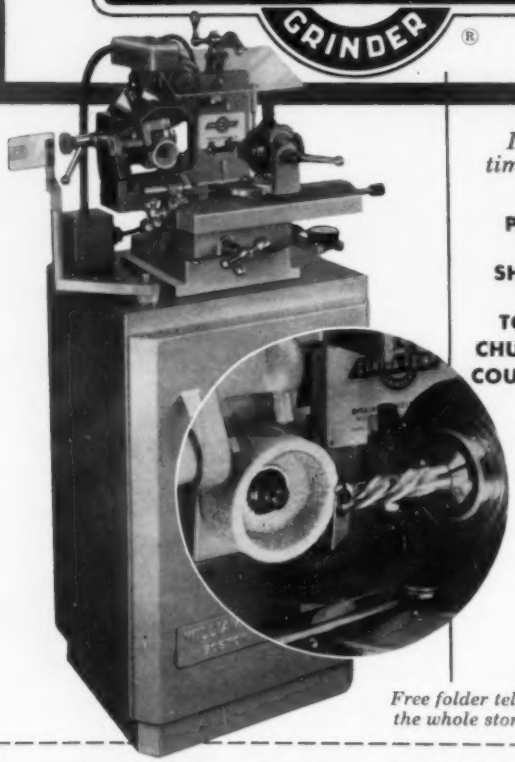

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METALS REFERENCE BOOK, Vols. 1 and 2, 2nd Edition—*by Colin J. Smithells. Published by Interscience Publishers Inc., 250 5th Ave., New York 1, N. Y. Price $25. 967 pages.*

The necessity for a second edition of this Reference Book results from the scientific investigation that has been carried on in the past few years. Several sections have been entirely rewritten and new sections covering elastic properties and damping capacity, physical properties of molten salts, and friction, together with a more complete bibliography, have been added. New values have been substituted in the tables whenever recent determinations or more reliable data have become available.

FUNDAMENTALS OF OPTICS, 2nd Edition—*by Francis A. Jenkins and Harvey E. White. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price $8. 647 pages.*

As compared to its predecessor, "Fundamentals of Physical Optics," the present text embodies extensions in two directions, the first being ten chapters on geometrical optics included to form a brief review of the principles of the subject. The second extension is the inclusion of a final chapter on the quantum behavior of light.

As the field of optics has continued to show a vigorous growth in recent years, new and important applications of old principles have appeared. Developments such as the phase-contrast microscope, directional radar, nonreflecting films, the electron microscope, and the Schmidt camera testify to the practical importance of optics as a field of study.

DYNAMICS OF MACHINERY—by A. R. *Holowenko. Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y. Price $7.50. 470 pages.*

Dynamics of machinery is defined as the study of motions and forces in machines. This book covers the problems of dynamics in any machine in which there are moving parts. It starts with velocity analysis, leading to dynamic

analysis. Dynamic analysis is presented with separate or combined static and inertia force analyses and the interpretation of the separate force analyses. In the development of relations the author has carefully used both analytical and graphical proofs when one supplements the other.

The material is not limited to academic, theoretical information, but in general is directed toward background with which the design engineer should be familiar.

ENGINEERING MECHANICS, 2nd Edition, —*by Archie Higdon and William B. Stiles. Published by Prentice-Hall, Inc., 70 5th Ave., New York City 11, N. Y. 590 pages.*

This edition has been the result of helpful suggestions by men in the field and has been directed toward putting emphasis on complete understanding by the student in the field. The free body concept is recognized as a powerful concept or tool to aid the student and is emphasized throughout the text. A discussion of the location of the centroid and the determination of the second moment of structural shapes has been added, together with an article on the use of Mohr's circle for principal moments of inertia of areas.

Approximately 40 percent of the problems in the first edition have been replaced and the total number of problems has been increased.

ELECTRO-MAGNETIC MACHINES — *by R. Langlois-Berthelot. Published by Philosophical Library, Inc., 15 E. 40th St., New York 16, N. Y. Price $15. 540 pages.*

This volume, divided into six parts, deals with questions common to the different classes of electromagnetic machines, that word covering transformers and rotating machines. It is a sort of grammatical or abstract study of the machines.

The book relates the various kinds of electrical machines to each other, recognizing them as being of one family having a common basis of existence.

PROTECTIVE COATINGS FOR METALS, 2nd Edition,—*by R. M. Burns and W. W. Bradley. Published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. Price $12. 650 pages.*

This book contains the most recent information on the composition, properties and performance of both metallic and organic coatings. Evaluation of organic coatings, new chapters on corrosion inhibitors, chemical conversion coatings, sprayed metal coatings are also included.

Many literature and patent references provide quick access to further, more detailed information.


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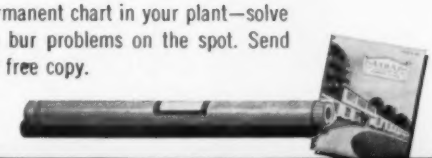

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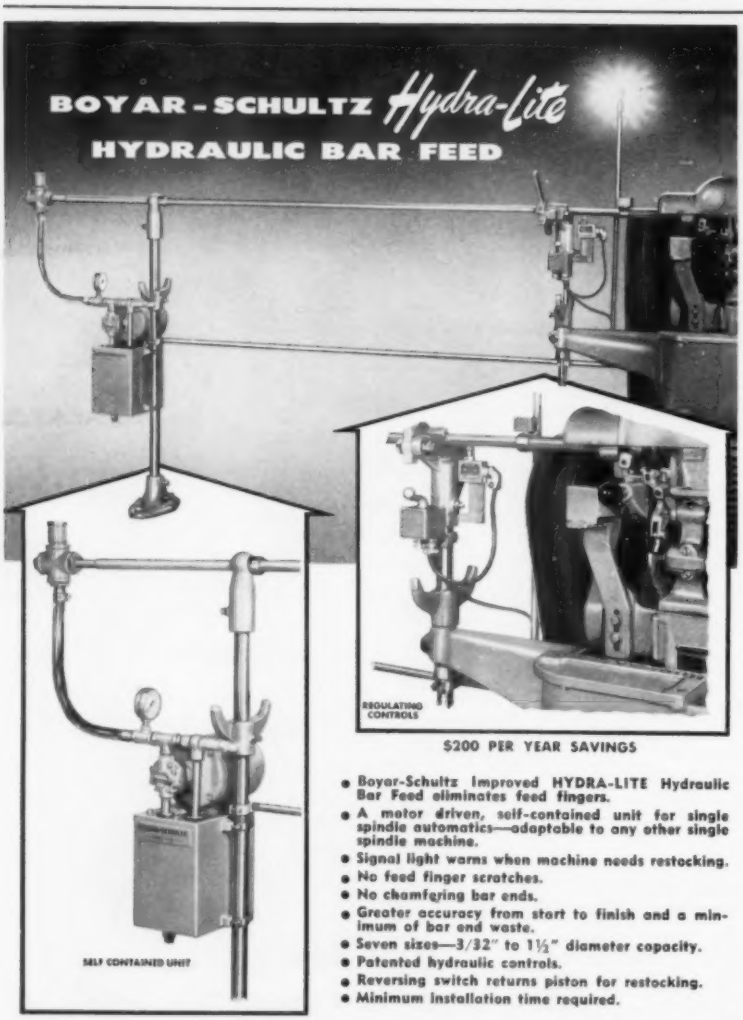
# technical Shorts

### Corrosion Tests of Aluminum Alloys

According to the National Bureau of Standards, some aluminum alloys can resist corrosion in either a marine or inland atmosphere for at least 20 years. These results were obtained in a long-range study conducted by the staff for the Navy Bureau of Aeronautics. Besides determining corrosion resistance of a large number of aluminum alloys, the study also provided data regarding effects of heat treatment and protective coatings on corrosion rates.

The investigation was begun in the 1930's. Since the Bureau's investigation was begun, compositions of some alloys have been altered to improve resistance and use of other alloys has been discontinued. It was found, for example, that noncopper alloys, such as 3004 and 5254, are highly resistant to corrosion and are in wide use where lightness, durability and corrosion-resistance are required. Aluminum-copper alloy 2017 has been replaced by clad 2024 for aircraft structural members, but is still used for extruded forms incorporated in airplane assemblies.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BROADVIEW, ILLINOIS


### Transistor Production Increased

Large-scale production of silicon grown junction transistors has been announced by Germanium Products Corp. of Jersey City. The silicon transistors are reported to operate at peak efficiency under a wide range of operating conditions, including high temperatures. Applications include aircraft and missile controls and accessories, and will afford reduction in weight and bulk of electronic equipment.

Important characteristics in the design of these silicon transistors include high input operating voltage, higher collecting operating voltage and decreased collector series resistance. These characteristics are said to permit the new transistors to operate efficiently in the large signal applications necessary in magnetic amplifier, computer and servo applications. The new transistors also offer lower noise figures, and increased power gains comparable to those found in high quality germanium transistors.

★ ★ ★

### New Materials and Processes

In the materials field, a patented chemical treatment has been developed by Aluminum Co. of America for continuous enameling of aluminum. The new conditioning treatment eliminates multiple chemical baths and prefiring operations, formerly necessary to insure controlled surface conditions of porcelain enameled aluminum. Substantial savings in manufacturing costs are anticipated from its use. It is expected to enhance the use of colorful porcelain enameled alumninum on buildings and elsewhere.

Another new process, this for bright cadmium plating, has been announced by Hanson-Van Winkle-Munning Co.

The process makes bright dips unnecessary and is both simple and low-cost, it is said. The process is used to protect iron and steel parts against corrosion and nonferrous metals against surface tarnish, corrosion or galvanic couples in assemblies.

A new nickel-chromium-boron-tungsten hard-facing material which provides parts exposed to extreme conditions of vibration and heat with a wear-proof, corrosion-resistant surface is reported by Wall Colmonoy Corp., Detroit. The new alloy has a high tungsten content which hardens the matrix, giving it improved heat and vibration-resistant properties.

★ ★ ★

THE LARGEST known adjustable rail milling machine is to be installed at GE's Large Steam Turbine-Generator plant. The machine, 120 ft long by 54 ft wide by 35 ft high is being built by Ingersoll Milling Machine. It will handle workpieces up to 18 ft wide and 16½ ft high. The machine was specially designed and will be tooled and fixtured for machining extremely large parts of steam turbine-generator units. Four 100-hp motors will drive the individual milling heads. The bed is 112 ft in length with two 17½-ft worktables. With this design, the two tables separate, permit setting up or unloading one workpiece while another is being milled. The tables can also be joined and used as one.

**Large-Size Machine Tools**

Under the same head, a large-scale lathe with a 144-in swing and 55 ft between centers has been installed in GE's Large Motor and Generator Dept. at Schenectady. The Betts-Bridgeford lathe was built by Consolidated Machine Tool Corp. of Rochester.

The live tailstock quill center is accurate to a total indicated runout of 0.0005 in. Electronic longitudinal and cross feeds permit feed settings at any increment from 0.002 to 0.75 in. per spindle revolution. The machine can carry jobs weighing up to 200 tons at speeds from one-half to 400 rmp. Centers alone will carry 200-ton loads at slow speed while steadyrests are set.

Bedways and carriage ways are of hardened steel, ground and polished. Renewable bronze liners are provided on both mating surfaces of the carriage cross-slide and on top mating surfaces of the auxiliary top slide and swivel. Tailstock bearings and carriage apron shoe bearings are bronze. An adjustable panel beside the operator's platform on the carriage contains pushbutton controls for starting and stopping, etc. Automatic limit switches at the ends of ways prevent over-travel.

Other interesting features are a shake-type chip disposal unit between the bedways. The lathe is driven by a 150-200 hp motor with nine other motors used to operate carriage and tailstock drives, blowers, pumps, etc.

The largest machine tool built in the 97-year history of Giddings & Lewis Machine Tool Co., was recently shipped to a plant in Italy. The planer-type milling machine measures over 26 ft high and 96 ft long, and weighs almost 500,000 lb. It required nine flat cars to transport it from the Fond du Lac, Wis. plant to the port of Milwaukee.

★ ★ ★


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**Produce Uniformly Accurate Smooth and Stronger Threads**

**Assure Low Tool Cost, Continuous Production with Less Down Time**

- **4 Standard Sizes**
- **For over 100 different single and multiple screw machines**
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- **Simple precision matching with prematched rolls**
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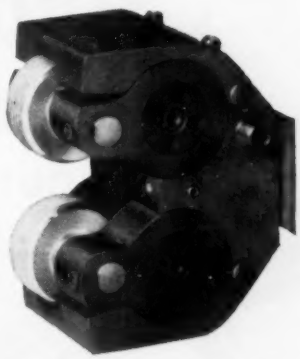

***SELF-COMPENSATING ROLL ACTION*** simplifies setup, provides longer roll life and reduces down time to a minimum. The ***side and alignment compensators*** ease undesirable side pressures on the rolls and assure smooth contact and withdrawal of the rolls from the work. The ***advance compensator*** allows rolls of the same diameter to be used and permits either roll to contact the work blank first.

FULL DIAMETER RANGE TO MAXIMUM CAPACITY

| Model No. | Thread Diameter Range | Approximate Number of Common Thread Sizes That May Be Rolled |
|---|---|---|
| B10 | 0—⅝" | 80 |
| B13 | ⅛"—13/16" | 90 |
| B18 | ¼"—1⅛" | 105 |
| B36 | ⅜"—2¼" | 170 |

*Write for Attachment Bulletin B-1*

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***Specialists in Thread and Form Rolling Tools and Equipment***

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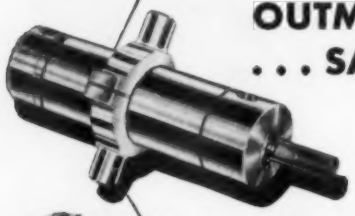
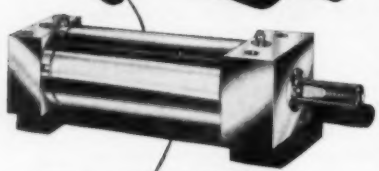
Spacemaker

CYLINDERS

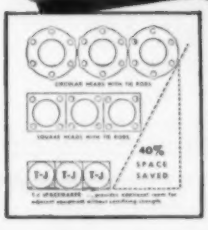
OUTMODE ALL OTHERS ... SAVE 40% SPACE!





You'll never go back to tie-rod cylinders, once you apply T-J Spacemakers to your push-pull-lift jobs! Advantages in space saved, weight saved, greater strength and off-the-shelf delivery are among the dozens of Extras you get as Standard!

Now—these sensationally popular T-J Spacemaker Cylinders are available off the shelf *in sizes up to 8".* This means as many as 64,000 different combinations of styles, bores, strokes, mountings, etc., *immediately available!* Oil pressure to 750—Air to 200 P.S.I. Super Cushion Flexible Seals for Air . . . New Self-Aligning Master Oil Cushion. Hard chrome plated bodies and piston rods (Standard). Only from T-J can you get these new ingenious cushion designs! Send for bulletin SM-155-2. The Tomkins-Johnson Co., Jackson, Michigan.

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DIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHERS

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**Plant Additions Announced**

As part of a modernization program, a new double-unit sand-shot blast cleaning machine has been installed at Empire Steel Castings, Inc., Reading, Pa. Although installed primarily for fine cleaning of stainless castings, the machine is also used for large alloy and carbon castings.

Along with other equipment recently installed, the plant is now prepared to handle cleaning of stainless castings.

Expansion of Clegg Laboratories of Morristown, N. J. to include development of automation systems for medium and small-sized plants has been announced. To provide these engineering, model shop and production facilities to meet demand for special sensing and control equipment and to expand their engineering services on design and development of special testing equipment, the firm is completing construction and equipment of a plant which will triple facilities.

It specializes in custom-built test facilities and in production of electronic scanning and control devises for many phases of automation in industrial plant machine operations. Test facilities are used in aviation, telephone power tube work, atomic laboratories, steel plants and other industrial operations.

Electronic computing equipment, along with a punch card system, calculates automatically manufacturing formulas for grinding wheels produced by Bay State Abrasive Products Co., Westboro, Mass.

In utilizing this new technique, a grinding application is analyzed by the engineer who determines the qualities needed. The wheel specification to furnish these is then recommended. The manufacturer calculates a formula for this specification. The new electronic computer calculates in seconds what a complete department could handle in a day, and performs these calculations with a consistent accuracy beyond human capacity.

According to the company management, in the not-too-distant future, similar electronic computing systems will be applied to manufacturing processes with ingredients of abrasive products being physically selected, measured, combined and processed.

Another announcement recently received concerns the increase in facilities for manufacturing special cutting tools specifically to customers' requirements. The firm is the Productive Tool Service, Inc. of Cleveland, Ohio.

* * *

**Wide Aluminum Extrusions Offer New Potentialities**

WIDE PROFILE aluminum extrusions, developed by Harvey Aluminum of Torrance, Calif. primarily for aircraft use, are now available for a wide variety of other applications, according to the company. The design engineers in the aircraft industry are using wide extrusions to attain shapes of the desired finished section without assembly. Integral stiffeners and structural members are incorporated in the unit, with considerable saving in weight along with increase in strength.

Typical applications recommended by the company for wide extrusions include integral decorative and structural members for automobiles, decks, gangway construction, superstructure and so forth for marine use, stair steps and fire escapes, garage doors, panel house doors etc. for building.

★ ★ ★

**New Division of Illinois Tool Works**

DEVELOPMENT of special plastic and stamped metal fasteners will be the responsibility of a new division of Illinois Tool Works by the name of Fastex Div. effective January 1, 1956, it has been learned. This is the result of a reorganization of the Shakeproof Div. of the company which manufactures fastening devices for automotive, appliance and other industries.

The new setup is the result of the divergence in the types of applications, one of which is quite standardized while the other requires highly specialized fasteners of limited application, often requiring modification for each use. The specialized products will be designed and manufactured by the new Fastex Div. with its own separate engineering staff, manufacturing facilities and field representatives. Its facilities will also be available to manufacturers of various types of components, subassemblies and finished product.

★ ★ ★

**New Microcard Reader Announced**

A POCKET-SIZE Microcard reader has been perfected and is now available according to the Microcard Foundation. This organization was recently established on the Wisconsin campus in affiliation with the U. of Wis. Press to collect research materials and publish them in Microcard form. The Microcard process reduces as much as 50 pages of written or printed material to the size of a single 3 by 5 card. The system is a great space saver in libraries and other recording organizations.

The pocket-size reader was designed for momentary consultation and does not supplant the larger stationary readers, it was explained. With the introduction of this inexpensive, compact instrument, usefulness of a Microcard system is tremendously expanded. Industrial personnel will now be able to consult Microcard information at their desks. Though designed specifically for the purpose of card reading, the instrument is also suitable for enlargement viewing other items such as layout in tool and diemaking, color registration in printing and lithography.

**Welding Progress Awards Announced**

ENGINEERS in many different fields, in addition to welding, may be interested in a new contest announced by the James F. Lincoln Arc Welding Foundation for ideas to accelerate progress in arc welding. There are no restrictions on either the nature or extent of the ideas that may be submitted. A total of $20,000 in awards is to be offered with the first award to consist of $5,000. The contest opened January 1, and will close July 30. Further details can be secured by writing the foundation in Cleveland, Ohio.

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A•S•A STANDARDS—From Local and Factory Stocks

...of chromium or chromium tungsten oil hardening steels having greater wear resistance than that of regular carbon water hardening steels.

Heat treated in neutral atmosphere, electronically controlled under automatic timing.

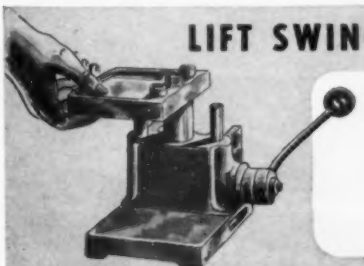
Accuracy • Concentricity • 20% Longer Service

PRECISION PIERCING PUNCHES

Precision controlled heat treatment and grinding. Made from high alloy steel. Initial high qualities are not reduced by grinding and resharpening.

Head, headless, also "ball lock" types, available in standard sizes from stock. Quick delivery on special sizes.

LIFT SWING DRILLING FIXTURE



"Swing away" top plate for faster and easier loading.

Back of fixture machined square to base for 90° operations.

Available in full range of standard sizes and with top plates in several styles.

*Quick shipment from stocks located in principal industrial centers*
*Write us for catalogs of all three*

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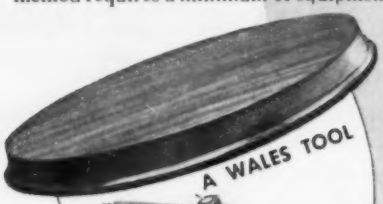
CONVENTIONAL DIES

## when the "WALES-WAY" takes ONLY MINUTES!

Die set ups are ready for action IN LESS THAN A MINUTE.

Punches, stripping guides, springs and guide buttons are all component parts of the Units . . . not attached to the press ram. WALES UNITS have a standard shut height of 5½" so only one adjustment of the ram is needed.

WALES UNITS may be used over and over again in infinite variety of PUNCHING, NOTCHING, NIBBLING jobs. This method requires a minimum of equipment at a minimum of cost.



WALES MOBILE TRUCK UNITS will demonstrate WALES-WAY methods right at your door. No obligation.

AND ELIMINATES HOURS OF

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- counter-boring for springs
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Illustrated with actual job work and full of interesting data and suggestions that you can adopt for your shop.

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**Electronics Facilities Increased**

PLANT EXPANSION by Retron Corp. of Pasadena, Calif. has increased production capacity by 40 percent. The addition consists of 15,000 sq ft of air conditioned, temperature controlled factory area. The move is the first phase of an extensive expansion program for increased facilities for engineering, research, design and production of precision electronic components such as potentiometers, modulators, filters and power supplies.

The firm is an affiliate of Reed & Reese, Inc., Pasadena, designers and manufacturers of electric and electronic coils for a wide variety of high temperature applications.

★ ★ ★

**Die Castings Awards Nominations Open**

NOMINATIONS for the Doehler Award, have been opened by American Die Casting Institute, national association of job shop die casters. The annual award is made for outstanding contribution to the advancement of the die casting industry or the art of die casting. Closing date for receipt of material is April 15.

The award is based on technical achievement, as measured by significant scientific contributions of a metallurgical or engineering nature; advancements in plant operation, of a management or administrative nature and related to the operational phases of the industry; or other activities that result in enhancement of the reputation and acceptability of die casting.

★ ★ ★

**Curing Tape Resistors**

DESIGNED by the National Bureau of Standards to meet the needs of mechanized production of electronics program sponsored by the Navy Bureau of Aeronautics, a liquid heat exchange medium is utilized to achieve a highly stabilized temperature control.

Although built as a laboratory unit, the furnace design is well suited to production line operations. It processes each resistor identically and makes possible manufacture of closer tolerance tape resistors for module wafers or printed circuit plates. It should also be equally valuable for firing or annealing other materials where time and temperature must be closely controlled.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-334

# FIELD notes

**Germanium rectifier** prices have been cut 25 percent by Hanson-Van Winkle-Munning Co., which should be good news to electroplaters and anodizers. Price reduction has resulted from improved germanium manufacturing techniques. In a few instances, prices for germanium rectifiers will now be no more than those for comparable selenium rectifiers. All H-VW-M rectifiers are designed for 24-hour a day operation at full capacity.

## new activities

**Production capacity** of Volkert Stampings, Inc., Queens Village, N. Y., has been increased 25 percent as a result of a recent 12,000 square foot expansion. Toolroom and engineering spaces have been increased also. This firm makes precision metal stampings for the electronics industry.

V V V

**Shell molding** and wax investment casting will be done by new departments created in the Alloy Precision Castings Co., Cleveland, Ohio. These activities have been added to supplement facilities for mercury investment casting so that castings can be manufactured in the most effective and efficient way.

V V V

**Dearborn Gage** will enter the air gaging field and has formed a division to manufacture and market the company's recently developed column type air gaging instruments and elements at its Dearborn, Mich., plant.

V V V

**Industrial conveyors** are being added to the line of conveyors already being made by The Colson Corp., Elyria, Ohio. With this new line, the company is prepared to design and install complete plant material handling systems.

V V V

**Olin Mathieson** Chemical Corp. plans to enter the aluminum industry with a fully integrated aluminum plant requiring an initial investment of $120 million. The alumina plant, reduction plant and rolling mill will be in Clarington, Ohio. The power plant, connected to the operating plants by high-tension lines, will be across the Ohio River at Cresap Bottom, W. Va. The power plant will be on a new coal mine developed for this purpose. Four pounds of bauxite yield two pounds of alumina, from which one pound of aluminum is produced by about 9 kw-hr of d-c electricity.

V V V

**A new building,** to house all the present facilities, will eventually be built by International Packings Corp., Bristol, N. H., on a 70-acre site about a mile from their present plant.

## expansions

**Landis Machine Co.** is adding to their present Tap Division building in order to better supply thread rolling equipment and machines. This addition, 11,250 square feet of floor space,


Sesco positive holding

CAM CLAMPS

THEY MAINTAIN POSITIVE HOLDING PRESSURE—NEVER LOOSEN . . .

The effective clamping range solves the problem of variations in stock thickness up to ¼" and eliminates troublesome readjustments.

LAST INDEFINITELY . . .

→ because of heavy steel construction and precision assembly.

→ singly, or in multiple, on any machine tool, or operation.

→ and withstands severe vibrations, even on milling operations.

AND, THEY'RE AVAILABLE FROM STOCK IN 4 STANDARD SIZES . . .

→ with maximum holding pressure up to 1600 lbs.

→ and, 2 larger sizes are available on special order—with holding pressure up to 8000 lbs.

Patent No. 2,537,594

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engineers & manufacturers of machine tools and press room equipment

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will house the newly created Thread Roll Die Dept. and the Research Dept. Relocation of the Research Dept. will enable expansion of the research and experimental activities of this Waynesboro, Pa., company.

## new divisions

**Silicone** development, manufacture and sale will now be handled by the Silicones Div., Union Carbide and Carbon Corp. This move relieves Linde Air Products Co. of responsibilities in the silicone field. The new division is planning to increase reactor capacity and add equipment for compounding silicone rubber formulations in greater quantity.

v v v

**The Allison Co.** of Bridgeport, Conn., purchased as a wholly owned subsidiary a year ago by the American Chain & Cable Co., Inc., has ceased its corporate existence. It is now the Allison Div. of American Chain and will continue to manufacture rubber and resinoid-bonded abrasive cutting wheels.

v v v

**Giddings & Lewis** Machine Tool Co., Fond du Lac, Wis., has completed reorganization along divisional lines. The four main branches of the company are now divisions, with a general manager in charge of each. The four divisions are: G&L and Hypro, Cincinnati Bickford, Kaukauna Machine & Foundry and Davis Boring Tool.

v v v

**Establishment** of a Refractories Div. has been announced by Corning Glass Works, Corning, N. Y. The new division will consolidate development, manufacture and sale of conventional refractories, special high-temperature refractories and Corning Glascast Mold material for precision casting of metal alloys.

## corporate changes

**Erwin A. Slate, Inc.,** Gasport, N. Y., has been purchased by and will operate as a fully owned subsidiary of The Sheffield Corp. The Slate company will be the operating agency of The Sheffield Corp. for the upper New York State area and will represent the McCroskey Co. and their line of cutting tools.

v v v

**Schwarzkopf** Development Corp., Yonkers, N. Y., has been created to succeed the American Electro Metal Corp. (Md.). Its activities will cover all fields of powder metallurgy. The new corporation owns the largest European powder metallurgy plant, American Electro Metal Corp. (Del.), has a large interest in American Sinteel Corp. and has acquired the majority of outstanding shares in The Borolite Corp. Mallory-Schwarzkopf-Metals, Inc. is jointly owned by P. R. Mallory & Co. and Schwarzkopf. This company has been organized to produce molybdenum and other high-melting metals.

v v v

**Pines Engineering** Co., Inc. has purchased the assets and patent rights of Roto-Mation Motors, Inc., St. Clair, Mich., and formed Roto-Mation, Inc. in Greenville, Ohio. The new corporation will manufacture and sell a hydraulic-pneumatic oscillating torque motor.

v v v

**The assets and** business of the Southwest Fabricating & Welding Co., Inc. have been purchased by the Walworth


WHEN SHARPENING DRILLS

PRECISION

IS ALL-IMPORTANT...

THE Oliver DRILL POINTER

With the Oliver 510 Drill Pointer, all of the movements in sharpening a drill are automatic, and accomplished by fixed mechanisms to eliminate all chance of error. The Oliver 510 holds all drills from ¼" to 3" diameter and provides varying angles from 82 to 160 degrees. Available for either wet or dry grinding.

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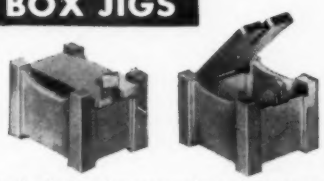
**"T" ANGLE PLATES**

Our "T" Angle Plates have many applications as milling fixtures, comparator stands or drill jigs. The addition of a few special parts make this a complete fixture at little cost. Normalized, precision-machined castings—7 standard sizes.

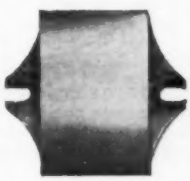
**BOX JIGS**



Standard's Box Jigs are made in either square or rectangular styles in 9 sizes. It will pay you to have them on hand in several sizes.

**MILL FIXTURE BASES**

Mill Fixture Bases are available in a variety of sizes. All are normalized and precision-machined. They are furnished with either standard keyways, or jig-bored holes for "Sure-Lock" Fixture Keys at no extra cost.



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**FREE CATALOG**

illustrating our complete line of top quality jig and fixture parts.

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See Us—ASTE Exposition—Booth 1407

**STANDARD PARTS CO.**

1012 BROADWAY • BEDFORD, OHIO

INDICATE A-3-337-1

Co. with an exchange of 107,039 shares of Walworth. common stock. The acquisition was another step in Walworth's announced plan of product diversification and expansion. Present management and employees are being retained for Southwest which now will be operated as a Walworth subsidiary.

v v v

**All design**, engineering and manufacturing data plus all patterns of the complete line of Barrett Machine Tools have been acquired by Forney's Inc. The material acquired dates from the year 1900 to date, consequently the purchasing firm is able to supply replacement parts for all machines now in use as well as supplying new machines.

v v v

**Stock and manufacturing** rights of the Worcester Drill Grinder have been acquired by The Black Diamond Saw & Machine Works, Inc. The drill grinder, which was developed at the Worcester Polytechnic Institute and was manufactured by them for some time in the Washburn Shops. The grinders will be distributed exclusively through the Edward Blake Co., Inc., West Newton, Mass.

## new offices

**A new** Timken Roller Bearing Co. office and warehouse has been opened at 886 S. Third St., Memphis, Tenn. A complete range of Timken tapered roller bearings will be stocked.

v v v

**Research & Control** Instruments Div., North American Philips Co., Inc., has established a new office at 96 Bloomfield Ave., Newark, N. J. This office will serve the territory formerly covered by the F. J. Mullowney X-ray Co., Trenton.

## moves

**The research** division of Marquardt Aircraft Co. has been moved to larger quarters adjacent to the company's production and engineering plants. The expanded area provides for an expected increase in the size and scope of the division's activities.

v v v

**Sid Tool** Co., Inc., New York, N. Y., has moved into 12,000 square feet of space at 158 Lafayette St. The company handles special taps, drills, milling cutters and other cutting tools.

*If you really want to trim costs...*

**DON'T MISS duMONT AT THE A.S.T.E. SHOW BOOTH 1106**

*Minute Man*

**KEYWAY BROACH KITS**

For cutting keyways from 1/16" to 1" in any bore from 1/4" to 3" in *one minute* for as little as *one cent*.

*Minute Man*

**SQUARE BROACHES**

For finishing cast or drilled holes in one pass. In stock for 1/16" to 3/4" squares. Hexagon broaches and Production Type Keyway Broaches also in stock.

**duMONT TOOL BITS**

High Speed Ground, Square and Rectangular. Hold a keener cutting edge longer due to "balanced" toughness, red hardness and wear resistance.

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**MAGNETIC BASES**

Hold dial indicator gages — save set up time. Alnico magnet has 50 lb. grip on all four sides. 360° horizontal swing, 180° vertical swing.

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Mail complete information and Price List C

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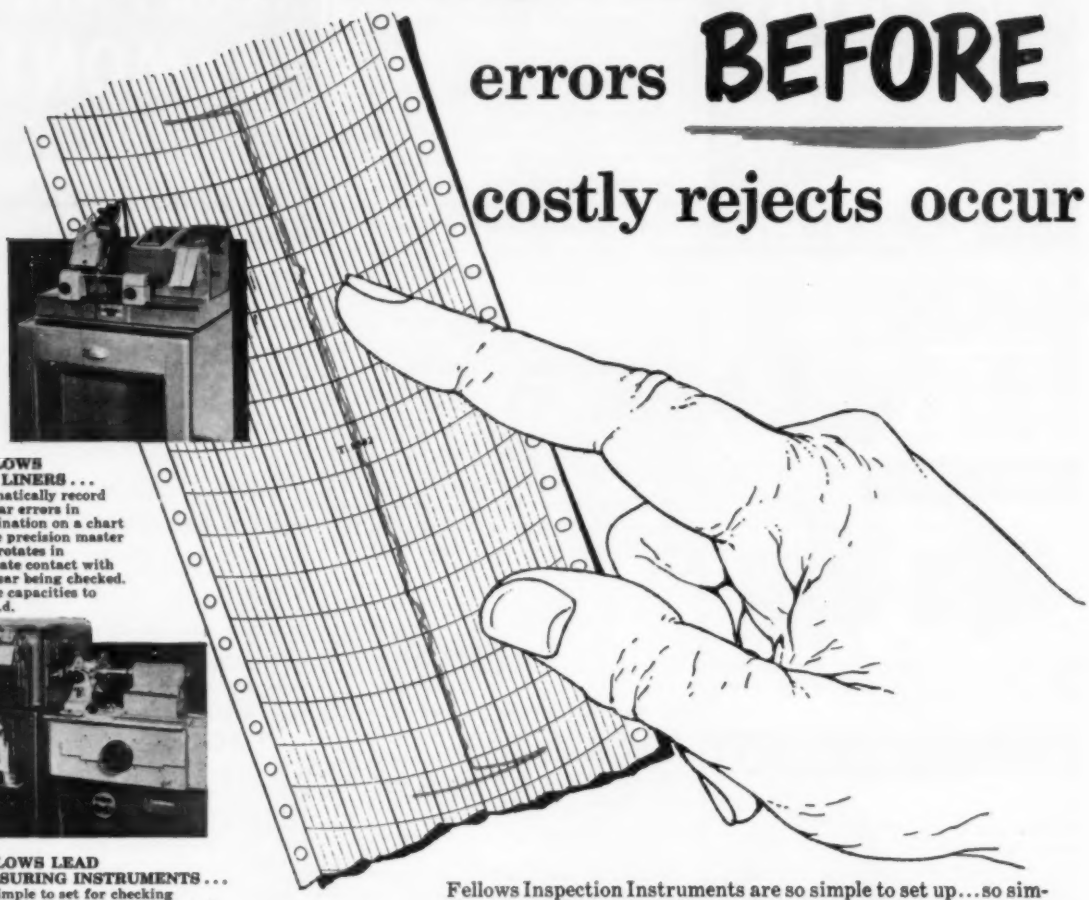
*Fellows Gear Inspection Instruments*

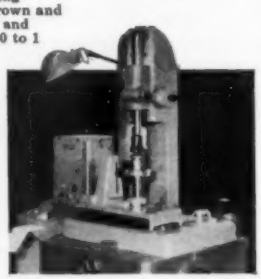
# Put your finger on all gear errors BEFORE costly rejects occur



**FELLOWS RED LINERS . . .** automatically record all gear errors in combination on a chart as the precision master gear rotates in intimate contact with the gear being checked. Three capacities to 18" p.d.

**FELLOWS LEAD MEASURING INSTRUMENTS . . .** are simple to set for checking various leads—also check crown and taper. Two capacities: 12" and 24" p.d. Chart errors at 500 to 1 magnification.

**FELLOWS INVOLUTE MEASURING INSTRUMENTS . . .** measure involute profiles—also location and amount of any involute modifications. Electronic recorders provide permanent chart records at 500 to 1 magnification. 12" and 24" capacity models.



Fellows Inspection Instruments are so simple to set up...so simple to use! Yet their accuracy assures positive quality control during production runs—finds and identifies gear errors before expensive hours of machine time and labor are wasted—prevents waste of costly material.

Whether you're making fine-pitch gears or large coarse-pitch ones . . . for your own use or for a customer . . . Fellows instruments give chart-recorded proof that specified gear limits have been met.

A Fellows Representative will be glad to show you how Fellows Gear Inspection Instruments can assure accurate and dependable control over the manufacture of high quality gears at the lowest possible cost.

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# What About Solar Energy?

Tech Digests

**Symposium on Applied Solar Energy**

AN IMPORTANT FACTOR in the rising interest in solar energy is a realization of the great need for more mechanical power in the non-industrial areas of the world. Economics of solar energy does not look attractive now in fuel-rich, highly industrialized areas. To build conventional power plants in remote, non-industrialized areas requires large capital investments such as the building of railroads, freight cars and engines, and the installation of coal mining machinery. Atomic power requires much less of these capital costs and so a higher price can be paid for it. The same considerations apply to solar energy.

Another factor in awakened interest in solar energy is the development of new materials. Large areas of solar collectors are required for utilization of solar energy and are expensive. Thin plastics are now available which cost only hundreds of dollars per acre. This is a new frontier where there is a chance of cutting costs and making solar devices more economical.

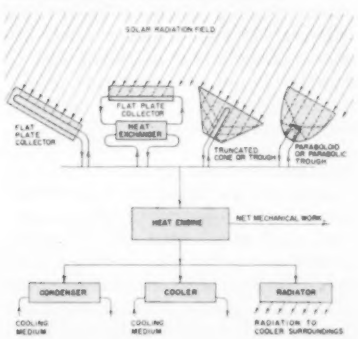
In marginal agricultural areas human labor can be conserved and work animals with high food consumption reduced, if a sufficiently practical and inexpensive solar engine can be devised. Pumping water for agriculture and household use and sanitation is the most obvious use for solar energy.

Intermittency of solar energy is a powerful deterrent to its use. Water pumping is not handicapped by this. Electric lights for homes and villages might come next in importance but some systems of power storage must be provided, possibly for only a few hours. Village industries, weaving, wood turning, furniture-making and machine work might be improved with solar engines of 1 to 10 or 100 horsepower. Solar refrigeration could conserve food and make possible use of protein materials with a resulting improvement in nutrition. Solar heating and cooking are definite possibilities if the units are cheap enough.

The possibility of solar distillation of salt water and solar heating and cooling of houses might open up new land areas to settlement and tend to relieve some of the world's population pressures. Another unique category of potential application is found in the field of astronautics for the generation of power on artificial satellites.

There are certain technical limitations in the conversion of solar energy to mechanical power. Some, such as maximum efficiency that can be attained by any heat engine operating between two temperatures, are understood and provide fixed fundamental barriers.

**Fig. 1. Solar collector-heat engine system showing alternate types of collectors and coolers or radiators.**




## Conversion Systems

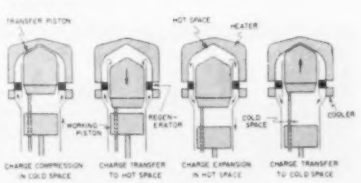
Solar-mechanical conversion systems such as shown schematically in *Fig.* 1, use a collector to gather the radiation from the solar field. This source of energy may be collected by a flat-plate collector, a truncated cone or triangular truncated trough, a dish-shaped paraboloid, a parabolic trough, or similar modification. From the absorber the heat must be transferred to an engine by a working medium such as steam, heated air, or similar working medium which either stores heat by an increase in temperature or a change in phase as from liquid to gaseous form.

One working medium can be used to pick up heat from the collector and through a heat exchanger, transfer its heat to another medium more suitable for use in the engine. Once heat is collected and transferred to the point where power is to be developed, an engine of some type must be used to convert the heat into mechanical energy. Since only part of the heat can be so used, a portion is rejected either through a condenser or cooler or through a radiator that permits rejection of the heat by radiation to the cooler surroundings.

## Typical Solar Engine

Potentially, hot-air engine cycles are quite well adapted to solar energy utilization. Apparently, such engines can be designed simple in operation and maintenance. Operating temperatures of hot-air engines are limited only by metallurgical properties of materials used and lubrication problems at high temperatures. Thus, further solar hot-

**Fig. 2. Hot-air engine, showing cycle sequence.**



air engine cycle research is indicated.

A simplified version of such an engine and its operation is shown diagrammatically, *Fig.* 2. Gas is compressed in the cool space of the engine and by means of a transfer piston, made to flow through a regenerator into a hot space surrounded by the engine heater. Expansion of the air charge occurs and the gases, now at increased pressure, are again transferred through the regenerator to the cold space where the high-pressure gases expand to activate the working piston.

For many years inventors have been fascinated by potentialities of solar power, and many attempts have been made to develop solar-mechanical power-conversion systems. No fully developed system has to date shown economical feasibility. This may be modified, however, by further technological advances and depletion and resultant shifting relative costs of current prime energy sources, the stored fuels.

### Other Solar Devices

Another avenue for development lies in the photovoltaic cell. Bell Telephone Laboratories have raised the efficiency of this to 11 percent. This is an order of magnitude higher than the best previous devices and makes use of this type of solar energy converter a distinct practical possibility.

Although the silicon solar battery is more efficient than best previous devices for converting solar energy directly into electricity and has some promising communication applications, this new power source is still an experimental device. As such, it is too expensive to compete with more conventional large package power generators, and should be considered only in special application, at present.

For air conditioning purposes, the heat pump offers several possibilities for overcoming some of the present handicaps of direct utilization collectors. Investigations in this field have been performed by American Gas and Electric Service Corp. which developed an experimental design, *Fig.* 3. The operating circye is identical to a conventional refrigeration cycle The compressor circulates the refrigerant between the evaporator, which is kept at about 60 F or lower, and the condenser, which is usually about 110 F or higher.

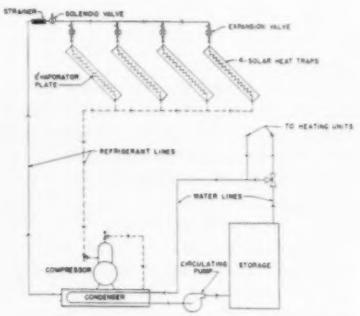



**Fig. 3. Flow diagram for solar heat pump system.**

The refrigerant changes from a liquid to a gas in the evaporator by obtaining the needed heat of vaporization from solar and sky radiation. To complete the cycle, the refrigerant changes from a gas to a liquid in the condenser by giving up the latent heat of vaporization to the circulating water. The heated water is then delivered to the storage tank for use in the heating system.

Test results on the heat pump solar collectors can only be considered as exploratory in nature. Although data obtained will not permit definite conclusions or design recommendations, it does indicate probable performance of this type of system and is sufficiently encouraging to warrant additional research.

### Conclusions

These are some of the current developments in solar research. Solar energy utilization will probably start with small units costing only thousands of dollars, rather than millions. Yet there is no sudden era of solar prosperity just around the corner. There is still much to be done by scientists,

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inventors and engineers. None of the present engines and generators will be rendered obsolete by solar energy. Atomic energy and solar energy each in its own way will supplement present power producing machinery. Yet by a judicious combination of fossil fuels, atomic energy and solar energy the whole world can have within this century, all the mechanical power and material comforts that it wants.

From the following papers presented at the World Symposium on Applied Solar Energy: "The Sun's Energy" by Farrington Daniels, Univ. of Wis., "Electricity from the Sun" by G. L. Pearson, Bell Telephone Laboratories, Inc., "Design and Performance of a Solar Collector Heat Pump" by Philip Sporn and E. R. Ambrose, American Gas and Electric Service Co., "Mechanical Energy From Solar Energy" by Richard C. Jordan and Warren E. Ibele, Univ. of Minnesota. November, 1955.

▼ ▼ ▼

## The Place and Value of The Technical Society in Industry

**By Adolph Monsaroff**

**Monsanto Canada Limited**
**Montreal, Canada**

Technical employees should become aware of the fact that the sales function is not explicitly reserved for employees designated as salesmen. The technical man interested in society affairs brings tangible and intangible advantages to the company from the sales point of view.

Acquaintance with employees of other companies can bring information of value to the purchasing department or interest to the research and development groups. The reputation acquired by an employee in society activities can reflect credit or discredit on his company. The company's reputation is enhanced by creation of a favorable opinion among other technical men and educational institutions. Also the appointment of an employee to a high office by his society, and other awards and recognitions inevitably add prestige. Similarly, publications and technical journals sponsored by professional societies are marks of distinction to the company as well as the employee who reports the results of his research or investigation.

Tangible assets often accrue from activities of this type. One of the most important is in the field of recruitment. Bright young men are attracted by more than physical assets of an organization. Included under this head is the crucial part played by friends in universities.

Training, under the head of manage-

**H & F** TURRET DRILL PAID FOR IN 6 MONTHS BY SAVINGS IN REJECTS ALONE

**hf**
**TURRET DRILL CASE HISTORY No. 26**

**MANUFACTURER**—Clifford Manufacturing Company, Waltham, Massachusetts

**PART**—Tellurium Copper Forging

**FIXTURE**—Single position, bolted to machine table

**OPERATIONS**

1. Load.
2. Combination center and countersink, 750 r.p.m. Index.
3. Rough drill .285 diameter, 550 r.p.m. Index.
4. Drill ⅛" diameter, .440 deep, 1450 r.p.m. Index.
5. Drill #53 .610 deep, 2875 r.p.m. Index.
6. Finish counterbore .285 diameter, .250 deep, 1000 r.p.m.
7. Unload and Clean.

| Production Rate | On H&F Turret Drilling Machine | On Conventional Multiple Spindle Drill Press |
|---|---|---|
| Pieces per hour | 30 | 16 |
| Inspection | 10% | 100% |
| Rejects | 1.5% | 10% |

Note that the H&F machine has increased production 87%, cut inspection time 90% and rejects 85%. As the parts are worth $12 each, the savings in rejects alone paid for the H&F machine in 6 months.

**COMMENT** With the H&F machine, each spindle works on a common axis and runs at an optimum preset speed to an accurate preset depth. • The work is correctly positioned for each operation by a fixture bolted to the machine table. • Production is substantially increased because no time is lost moving work from spindle to spindle or sharpening tools dulled by contact with jig bushings. • Rejects are virtually eliminated because correct spindle speeds and accurate alignment of tool and bushing produce straight holes with a good finish. • Let H&F save money for you. • Write for catalog and further time studies.

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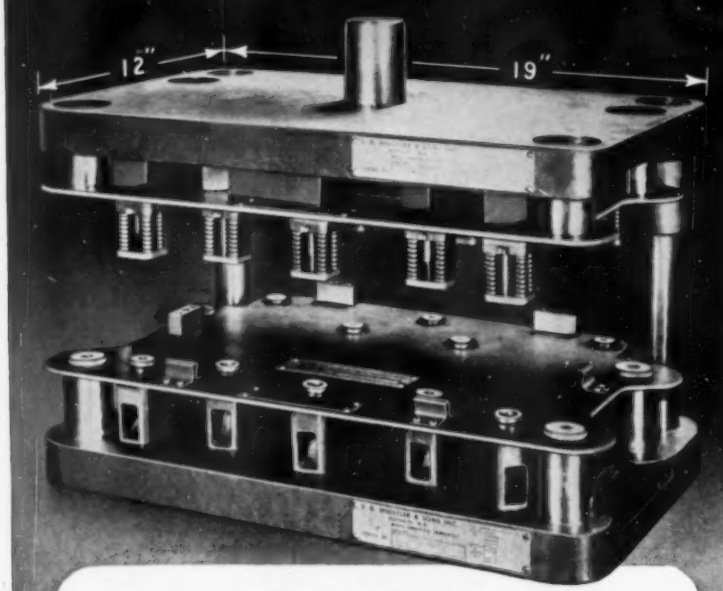


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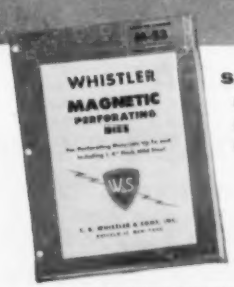


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ment development, executive development etc. is essential in business life and the kind of training an employee can get through participation and society work is beneficial to the employee and the company. Human relations skills which companies are anxious to have employees acquire can be gained by participation in technical society activities. Under this can be cited addresses to technical groups, reports of meetings, participation in discussions and conference leadership.

Professional development of the employee, his acquisition of knowledge through attendance at meetings sponsored by his professional organization, is of mutual benefit to the individual and his company. Broadening of interests and maturing of judgment resulting from participation in the diversified programs presented by his society is another stepping stone in the employee's professional growth and increasing value to his firm.

Professional spirit fostered by professional societies is a tonic each one needs. This is particularly true in the case of chemists, engineers and scientists who are fighting the battle of professional recognition by the public. Feeling of participation in useful group activity, the opportunity for community service often afforded by technical societies through appointment to various local or national boards or committees are factors in morale sometimes overlooked. Publications of papers in journals sponsored by professional organizations can also be considered as advantageous from this point of view.

Paper presented at the A. I. Ch. E. Annual Meeting at Detroit, November 29, 1955.

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## Automation and Quality Control

**By Jacob J. Jaeger**
**Vice President**
**Pratt & Whitney Co., Inc.**
**West Hartford, Conn.**

"Automation" has come to be a catchword used to describe the present era of industry. The word was coined in describing the transfer machines used in engine manufacture and is further applied to describe mechanized foundry and press lines. The word has so caught on that it has become the all-descriptive term used to cover all phases of automatic operation.

One area of automatic control known for many years, has found its way only

recently into general usage and production. That is tracer control.

This is the first type of machine in which feedback principle was utilized. In other nomenclature, these machines are controlled by servo-mechanisms. It is possible for the machine to copy a template shape or model with little or no help from the operator other than initial tool positioning. New freedoms of design have been made possible, and for the first time, radical departures from conventional structures have come into evidence.

A further extension of these ideas is now approaching realization. This is the machine controlled by playback. Principles demonstrated in the laboratory are ready to be put to work in the field as rapidly as needs and economics demand.

Now, without ever approaching the machine, it is possible to produce the same sort of information and commands by the introduction of direct numerical control. Basic drawing information is translated directly from the numbers coded on cards or tape and then translated on the machine to proper positions without intervention by the operator.

### How Programming Works

Production personnel are accustomed to translating drawing information in the form of numbers to concepts which can be called analogs. That is, how to take a length dimension from a drawing and stack a group of gage blocks so it matches the drawing information; or to read the graduations on a micrometer and compare it to the number on the drawing; or turn the dial of the machine and read how many thousandths the tool has advanced. These require the ability of human intelligence to translate numbers to dimensions. Now, such positioning as that of a jig borer, for instance, can be achieved completely automatically. Such is automation in even a grander concept than that of the mass production field.

While revolutionary ideas of cutting tools and machine tools were finding their way into productive use, so too was the gage engineer active in promulgating use of improved styles of measuring, indicating and recording equipment. New families of devices have been made available for various types of gaging operations. Continuous mill gages are used today which constantly gage sheet and with electrical instrumentation indicate and record any off-gage dimension. Rolls can be automatically adjusted to correct any deviation. The electro-limit comparator is important because its information is produced in a form that can be handled automatically for reading or recording or automatic control. Noncontacting air gage has found acceptance in all areas of measurement. Radiation-type gages are capable of producing information in a form that can be used in automatic machinery.

Thus, inspection has begun to use new automatic techniques to eliminate individual handling and measurement of components. As a further extension, automatic classification equipment has come into general use.

With this accumulation of knowledge in control, the stage is set for the marriage of two techniques . . . that of the process engineer and the machine tool builder with that of the inspector and gage maker. This can bring forth a broad area of automatic control to influence the entire concept of manufacturing. With combined efforts, a machine can be created that can be told what to produce and that can be given the opportunity to correct itself. Self-inspection and self-correction, automatic manufacture, automatic inspection and automatic correction of errors!

How? In the same way that a continuous mill gage automatically controls the screw-downs so correct thickness is always being rolled with a minimum of scrap and maximum of zero tolerance material. This idea has been done in the past in simple forms, but its application on a broader scale is foreseen. External grinders continuously measure a part in process and cut off the infeed when the gage informs the machine it has reached the proper dimension. This


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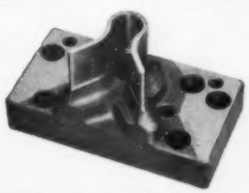
Before hardening, this two-station die block was Moore-Jig-Bored to eliminate the need for excessive grinding. After hardening and surface grinding, all holes were Moore-Jig-Ground to exact size and location. Blank hole and center piercing hole were ground with ½° included taper. Little clearance could be allowed between punch and die. Jig grinding time: *only 2¼ hours.*



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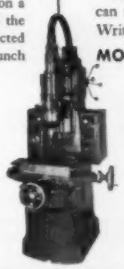

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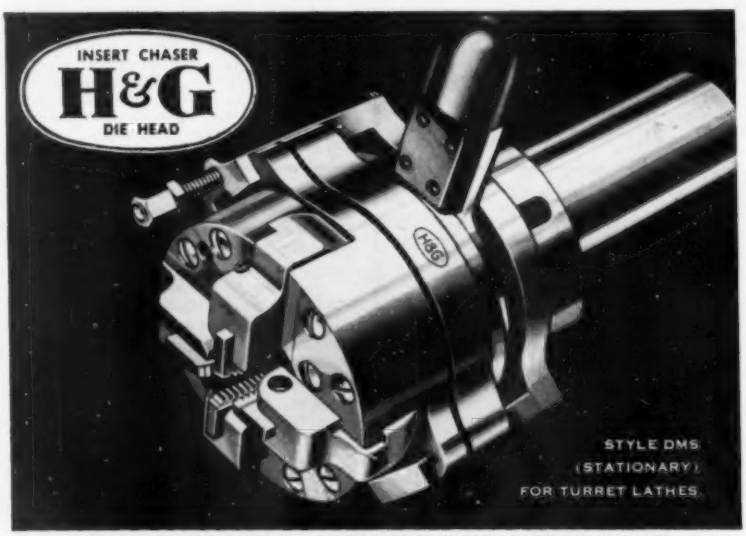


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is a simple application. The gage can be introduced without interference with the grinding wheel; the part is relatively clean and a minimum of vibration is experienced. Operations are relatively slow and equipment can be put together with minimum effort.

As an extension of this principle, each piece may be gaged at the completion of the operation and automatic reading causes tool adjustment so the part heads towards the center of tolerance. As tool wear occurs, the tool can be gradually advanced, keeping parts within a narrow tolerance band. Further, when tool has advanced due to wear beyond desirable limits for parts quality or regrind of the tool, a new tool or cutting edge could be brought into play, the slide retracted, and again self-adjusted to find the center of tolerance.

What is the ultimate result of an approach to this sort of operation? One thing is better and better assemblies. Concepts of manufacturing that involve selective assembly must change. If machinery can be developed which will always tend to make parts in the center of tolerance and within the same spreads that are possible for short periods of time, considerably more desirable products can be produced. Furthermore, at reasonable cost. Systems of this kind can be expected to produce parts of higher quality, with less scrap and with less exacting skills on the part of the machine operator.

From a paper given at the New England Conference of American Society for Quality Control, Hartford, Conn., Nov. 1955.

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## Resistance Welding Titanium

**By Robert Wiekham**

**Marquardt Aircraft Co.**
**Van Nuys, Calif.**

The advances in electronic controls for resistance welding machines has enabled welding engineers to develop a welding schedule using critical preheat, weld and post-heat times and currents that result in an extremely ductile spot weld in commercially pure titanium. The work was performed, both experimentally and in production, on a 75 kva three-phase frequency converter control welding machine using commercially pure titanium 0.040 in. thick.

The ductility of the welded joints is demonstrated by their ability to be bent across the face of the weld 180 deg over a 2T bend radius without fracture. Ten-

sion shear ratios of 0.32 and higher are possible using preheat and post-heat welding techniques. The ductility of the joint results from the low welding heat input for a short time that is possible when pre and post heating of the weld are used. By keeping the high welding heat to a minimum and by supplementing it with low pre and post heats, the absorption of embrittling gases from the atmosphere is markedly reduced.

From a paper given at the AWS National Fall Meeting, Oct. 1955, Philadelphia, Pa.

▼ ▼ ▼

## Magnesium Tooling Experience

**By Thor H. Bahrman**

**Tool Design Engineer**
**Republic Aviation Corp.**
**Framingdale, N. Y.**

Many new techniques in tooling had to be devised in the aircraft industry during the Korean emergency. Often tools had to be handled manually. Because of weight limitations for manual handling, it was impossible to build enough rigidity into tools even with lightest steels and have them light enough. This accounts for increasing selection of magnesium for tooling.

In addition, magnesium is free machining in the wrought as well as cast

**Fig. 1. Master tool of magnesium covers 12 feet in length, provides ease of handling and permits maintenance of close tolerances required.**

form. This allows heavier depths of cut and higher rates of feed than other metals. It is stable and can be machined on an ordinary tool room machine. It saws readily on high speed band saws or table saws and can be sanded with disc or band sanders with proper precautions. Machines used have accumulators that collect and deposit sawdust and grinding particles in oil.

**Abrasive Cutting** | *the best way to cut many materials* *the only way to cut some*

**Campbell Cut-Off Machines**

Rough, serrated cut of metal saw

Smooth-finished cut of CAMPBELL Abrasive Cut-Off Machine with ALLISON Wheel

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When machining heavy cuts danger of fire is at a minimum, however, ordinary precautions should be taken with fine cuts of above 600 sfpm. Use of mineral coolants for that speed is necessary. Chips and dust should not be allowed to accumulate on machines or clothing of operators, and should be removed frequently and stored in covered metal cans, clearly labelled.

Recommended fire extinguishers, such as Pyrene G-1 powder should be within easy reach of operators. Water or any common liquid gas or foam extinguishers will intensify magnesium fires and should not be used.

Other advantages for tooling are that magnesium can be welded by any of the common methods with shielded arc welding preferable. Weld efficiency of the joints for common magnesium alloy is 95 per cent. Warping due to welding of an assembly can be corrected by clamping and heat treating. The high coefficient of expansion, close to that of aluminum, is advantageous.

Cost is less than competing materials on a volume basis.

A typical example of a master tool is shown in *Fig.* 1. This is 12 feet long and represents the bottom of an airplane. This is used to drill holes for attaching four access doors. Because the coefficient of expansion of magnesium is close to aluminum, used in the parts, closer tolerances could be held with this jig than with one of steel, in addition to the greater ease of handling.

Another example of advantage of light weight is shown in the fixture shown in *Fig.* 2. This is used in a part of the factory where no overhead crane is available. Its purpose is presetting cables and control rods for tail surfaces of the plane. The structure is welded magnesium with a weight of 147 pounds. Of this, 56 pounds are steel. If the entire fixture was of steel it would have weighed 476 pounds and have been impossible to use under the prescribed conditions.

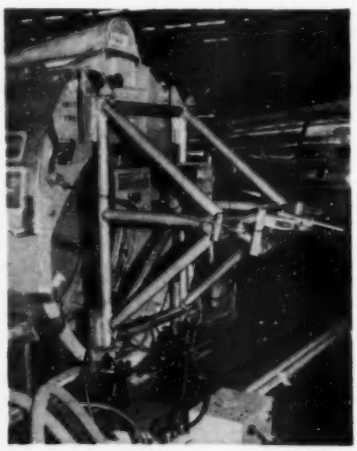

**Fig. 2. Fixture for presetting cables and control rods of tail surfaces. Welded magnesium construction is used with steel reinforcement.**

Other uses of magnesium in tooling are for stretch dies where it is more effective than aluminum because galling is eliminated. Form blocks used in hydropresses for rubber forming is an excellent application also.

In machining operations applications are numerous. Milling fixtures, lathe fixtures, drill jigs and gages are among these uses. Magnesium is especially useful in aircraft industry where short runs of parts create handling problems.

From a paper presented at the Annual Convention of the Magnesium Association, Nov. 1955, N. Y., N. Y.

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## How to Use Weldments Effectively in Machinery

**By Omer Blodgett**
The Lincoln Electric Co.
Cleveland, Ohio

Some interesting technical information has been developed by the author to aid manufacturers of machinery in use of welded steel construction to the greatest advantage. The paper presents and discusses a method of specifying welds to meet strength, rigidity and fatigue requirements. Through experience with many machinery manufacturers in different parts of the country, the author has evolved some interesting ideas, contrary to those commonly held to be good practice. These include placement of materials for most effective use of the inherent properties of steel.

The discussion also covers methods for the most economical fabrication of welded design. Some of these include short cuts for design calculations, such as nomographs and calculators for determining weld size and cost. Much of this information has never been published previously.

From a paper given at the American Welding Society National Fall Meeting, Oct., 1955, Philadelphia, Pa.

▼ ▼ ▼

## Use of Radioactive Tracers in Research and Development

**By C. R. Lewis**
Chrysler Corp.
Detroit, Mich.

Greater availability of radioactive isotopes in recent years has opened the way to new methods of attacking research and development problems. Radioactive forms of nearly every element are available commercially as a by-product of nuclear work carried on by the government. When a small amount of radioactive material is included as part of the system undergoing test, the active portion can be followed with considerable ease and great sensitivity.

Radioactivity is a property of the original material and is not transferred to any other materials which may be present. It is not affected by any physical or chemical changes to which the system incorporating it may be subjected. Only a comparatively small number of atoms of radioactive material are needed to make quantitative measurements.

These properties of radioactive tracers make them quite suitable for the study of wear processes. For instance, they have been used in the study of

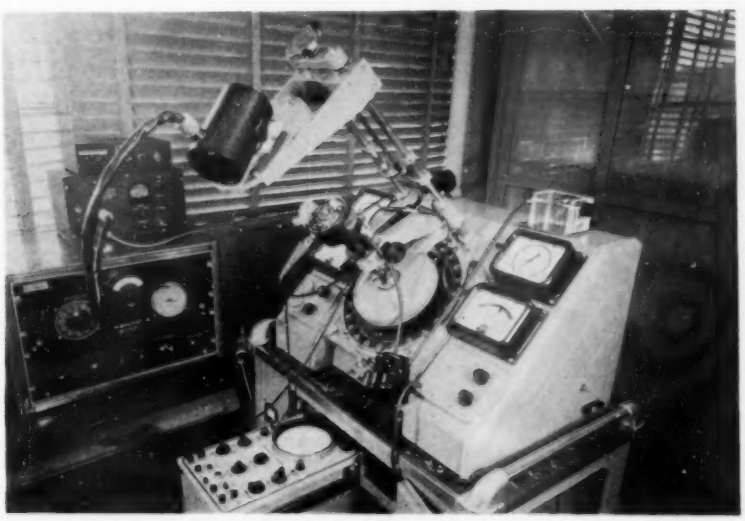

**Fig. 1. Test equipment for study of breaker point contacts, using radioisotopes, for measuring rate of wear.**

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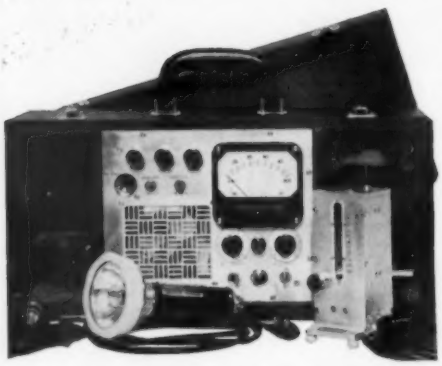

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wear of different types of electrical contacts, according to the accompanying illustration.

This series of tests was concerned with automotive electrical contacts. One study was made to improve operation of stop light contacts. A second was the breaker point contacts in the distributor, *Fig.* 1. The chart, *Fig.* 2, shows a typical result of such tests, with the apparatus in *Fig.* 1. With this means design characteristics of different setups could be studied.

Use of radioactive tracers make possible measuring very small quantities of

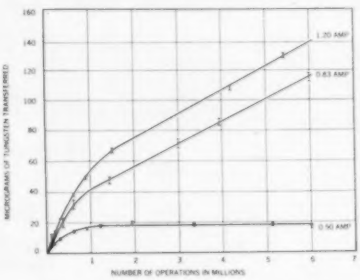



**Fig. 2. Result of typical test showing effect of average primary current on transfer.**

material involved in a wear process such as this. While the same results might be obtained by other methods, increased speed, convenience and accuracy resulted from the use of radioactive isotopes indicating good evidence of their ability to be useful in research development problems.

From a paper presented at the Nuclear Engineering & Science Congress Dec. 12-16, 1955, Cleveland, Ohio.

▼ ▼ ▼

## Low Cost Tooling for Short Runs

**By Leonard E. Mueller**

**General Foreman and Engineer**
**Ohio Chemical and Surgical Equipment Co.**
**Madison, Wis.**

In shops such as ours, the greater number of work orders come through infrequently and in small quantities. A part produced three times a year in lots of 400 or less would be considered average. Nearly 35,000 separate items are manufactured. Costly tooling standing idle 98 percent of its lifetime represents a real investment under such conditions. Therefore, any device which can reduce this cost without increasing

labor costs excessively is usually well worthwhile.

This is not to give the impression that crude tooling is practical. On the contrary, all facts concerning the job must be gathered. Only after careful analysis can a sound decision be made.

The aircraft industry must constantly attempt to reduce tooling costs because design revisions are frequent and pro-

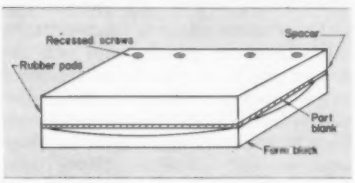



**Fig. 1. Roll forming compound contours with inexpensive tooling.**

duction quantities are usually small. Many money-saving ideas can be gained by adapting their techniques.

Cerro-bend metal, Kirksite, hardened lead, cast iron, Meehanite, aluminum, Masonite, Impregwood, plastic materials, rubber and hardwood are common in aircraft tooling. One aircraft company recently investigated and found they could save considerable amount by casting larger dies from aluminum rather than Kirksite. Although the aluminum material cost 17 percent more per pound, it weighs 66 percent less, thus a saving of $30,636 was realized on the first 56 dies produced.

Tooling described in the accompanying sketches has been used under proper manufacturing conditions and should prove satisfactory for industries with similar problems and circumstances. Shown in *Fig.* 1 is a form lock for roll forming of compound contours using a

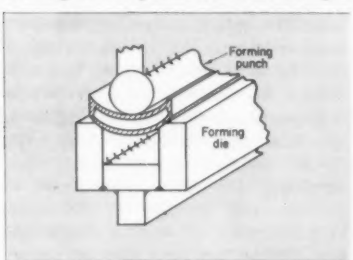



**Fig. 2. Multiple tube forming, cast in Cerro-bend block.**

rubber pad. *Fig.* 2 shows a multiple tube forming punch in which the entire block of tubes is formed in one stroke of the press. These are typical examples of methods of cutting costs on short run tooling.

From a paper presented at the Tool Engineering Institute, University of Wisconsin, Sept., 1955.

▼ ▼ ▼

## Engineers on the Industrial Research Team

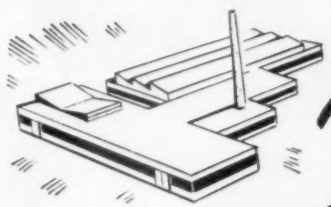
**By E. W. Engstrom**

**Executive Vice President**
**Research and Engineering**
**Radio Corp. of America**
**New York, N. Y.**

As industry and associated technology become more complex, specialization becomes a necessity, both in science and in industry. The association of scientists with industry marks the birth of industrial research. Science, has come to have increased meaning and purpose in industry. Working relationships between scientists and engineers have developed into the scientist-engineer team.

A full partnership has developed. In fact, earlier distinctions of function now cannot always be recognized. A bridge of communication has been formed between scientists and engineers in industry and the scientists in the universities. The practical applications of science have been greatly speeded as a result.

Growth of the research team, composed of theorists, applied scientists and development engineers, is distinctly a phenomenon of the twentieth century. With modern research effort, research men can formulate a new concept and see it applied in a positive way to contemporary living.



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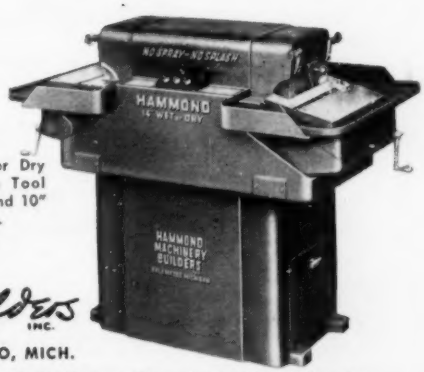


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## technical digests

Today, forward-looking industries are fully aware of the possibilities of research, and are investing more and more in it. It has taken an important place in administrative planning. There is no longer a question of the place of research in industry. Rather, the question is how to make it more effective.

### Profile of Research Workers

An effective research team must include creative people with all the needed skills. It must be so organized and supported as to satisfy the motivation of these people. The research team must be so constituted that its members work smoothly together. There must be cooperation between members of the team and the development and production engineers who must carry research results into production.

Insofar as they can choose, industrial laboratories pick for their research teams, men who are creative and who are well-trained in fundamentals of science. They choose men of good character, men of vision, energy and drive. They look for men who have scientific curiosity but who, at the same time, have a practical outlook, men who practice cooperation and who can make good use of the freedom of the research environment.

They also hope for research workers with continuing mental youth. Industrial laboratories value research workers who are good salesmen of research ideas. They value men who are adept with their hands and who can express themselves well in speech or writing.

When considering a person for a particular job, the desired research qualities are not always weighed the same as qualifications discussed in general terms. The reason for this is that the same type of person is not desired to fill all industrial research jobs.

Research thrives on freshness of viewpoint and differences of approach to the solution of problems. These conditions are achieved by varied environments of training, by differences in prominence of several characteristics, and by continual flow of persons from the halls of learning. The great problem today is proper cultivation and exploitation of the nation's intellectual resources, an environment conducive to good research must be provided. This includes creative imagination in the administration, sound engineering and good business planning.

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Presented at the June 1955 annual meeting of Am. Soc. Eng. Educ.

## Reducing Part Cost by Projection Welding

**By C. H. Burgston**
Deere & Co.
Waterloo, Iowa

Many farm implement parts, formerly arc welded have been redesigned and fabricated by means of resistance projection welding. These parts would be classified as heavy sectioned weldments.

Weldments should be designed for the projection process rather than adopting the process as another method of fastening. Costs will be lower and usually a better product results. Good appearance in a weldment is a function of design. Product engineers can create and place projections properly to develop required joint strength.

### Experimental Welding Laboratory

Development work for the applications discussed was performed in an experimental welding laboratory with a 300 KVA single phase spot and projection welder. Instruments for various determinations were used, such as pressure gage, pointer stop ammeter, voltmeter and cycle counter.

Optimum welding schedules were recorded on a standard form which included a photograph of the test setup. The optimum welding scheduled was established on the basis of a satisfactory end product—that is, a strong weld to match service requirements.

### Production Projection Welding

During the past four years, 250 different implement designs have been developed for projection welding. High production jobs of 10,000 to 100,000 parts per year showed greatest savings and justify the high capital outlay for welding equipment. Proper production tooling is very important. Supervision and inspection are essential. Properly established welding schedules and good shop controls are also important.

In appropriate applications it was found that in the change from a former method to projection welding, often production increases of 5 to 1 up to 10 to 1 were realized per hour. This was reflected in drastic direct cost reductions, lower weldment costs and a better product.

From a paper given at the American Welding Society National Fall Meeting, Oct., 1955, Philadelphia, Pa.

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## A Reappraisal of Titanium

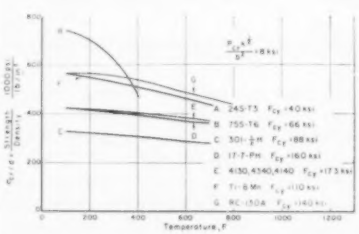

**By Donald J. McPherson**

**Metals Research Dept.**
**Armour Research Foundation**
**Chicago, Ill.**


Technically and strategically, titanium is a useful and opportune new material, but commercial application is limited by economic factors. Except for this fact railroad cars, trucking, shipping, and even perhaps common structural components might well be manufactured of titanium within the next few years.

Economics, conflicting preliminary reports and the fact that engineering data on new material are naturally accumulated slowly, have caused some misunderstanding of what potential usefulness of titanium may be. There is no reason for pessimism about its future, however. Neither is over-optimism called for, but progress is being made on all fronts: alloy development, heat treatment, production quality, large scale handling and processing, and sponge production capacity. Titanium is the fourth most abundant element having structural possibilities, in the earth's crust. Only aluminum, iron and magnesium are more plentiful.

It comprises a larger proportion of terrestrial matter than all other metals combined, and known deposits of high grade titanium ores are sufficiently plentiful to insure a supply of the metal for many years.




**Comparison of strength-density ratios for panels and plates used in air frames, for various alloys and the structural index shown. Relative advantage of titanium above 300 degrees is evident.**

Although the ores are not really expensive, the annoying affinity of titanium for oxygen causes the winning process to be involved and extremely expensive. The price of the sponge metal has been reduced in less than a year and a half from $5.00 to $3.75 a pound,

and experts predict that it may reach an ultimate limit of $1.00 per pound. The sponge titanium, like any other raw metal, has to be consolidated, perhaps alloyed, and rolled or forged to a useful product.

Mill processing of titanium has turned out to be less of a problem than anticipated. The metal, once in massive form, can be readily handled hot in air without special precaution. Normal steel mill equipment is used and only limited modifications of practice are necessary. However, the special melting process involved has run the price of normal mill product costs from $10 to $15 a pound—an average of $25,000 a ton.

This might seem to relegate titanium to small scale speciality applications. In general, the alarming cost of mill products can be substantially reduced as a function of reduced sponge price, utilizing scrap, regular mass production and constantly improving general technology.

In spite of these prices, titanium is being used and the industry expanded. The Department of Defense appears to be convinced that an unquestionable superiority of the striking force, air, sea and land, hinges in a great measure upon incorporation of titanium into defense equipment.

A material will be economical for defense purposes when it can do the job that is needed better than other materials, essentially regardless of cost. Military economy is established by a consideration of whether the additional cost of using titanium is justified by some parameter of superior performance, such as mobility, speed, striking range, or increased payload.

Titanium may now be able to demonstrate long range economy in certain applications such as corrosion-resistant equipment and transportation applications where increased payload eventually earns increased capital costs and starts making profit.

One of the most publicized commercial applications is the substitution of titanium for stainless steel in engine nacelles and firewalls of the Douglas DC-7. Two hundred pounds in weight are saved by using 528 pounds of titanium. It is estimated that every pound saved is worth $40 in additional payload. Such applications are economically sound and will increase. In any application where increased payload per trip can be considered, titanium may well pay for itself in industrial competition.

From a talk presented at the Mechanics Colloquim. Armour Research Foundation, November 16, 1955.

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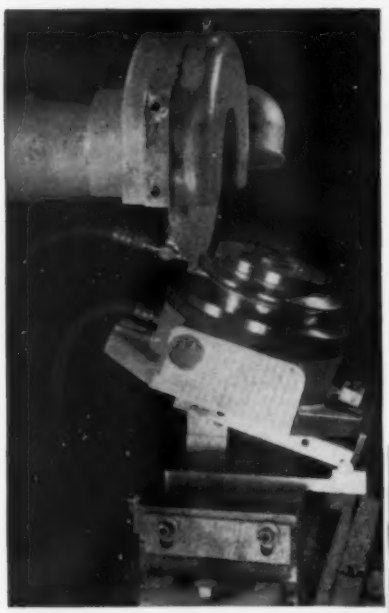
For example, Vulcan's Rotary Table can be used in connection with a sine plate or angle fixture. The dressing of large expensive external wheels for side grinding is therefore eliminated. If you wish we can provide permanent magnetic chucks designed for use with our table, both 6″ and 10″ in diameter.

Vulcan's Rotary Table is an air operated, self contained unit, portable between bench or machine. A precision center hole for locating and tapped holes in the table for clamping provides easy setup. Circular surface grinder applications are many and varied — grind flanged studs or bushings — bearing spacers — forming rolls — cutters — convex or concave surfaces — punches or dies (radius or angle).

Lapping? Yes — and in micro inches. For the 6″ and 10″ table, lapping plates of 12″ and 16″ are provided. Perfect for lapping valve plates, gages, bearing spacers and for carbide lapping using diamond powder. *Write for circular.*



Work clamped to motorized table, mounted on sine plate. Surface grinder application.

**Major Vulcan Services**

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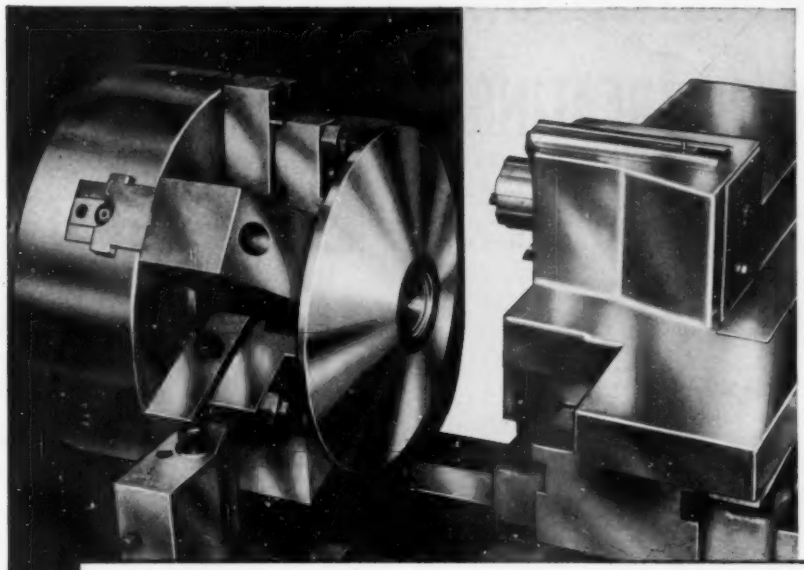
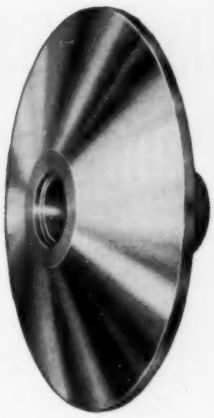
# ARE YOU REALLY POWERED FOR PRODUCTION?



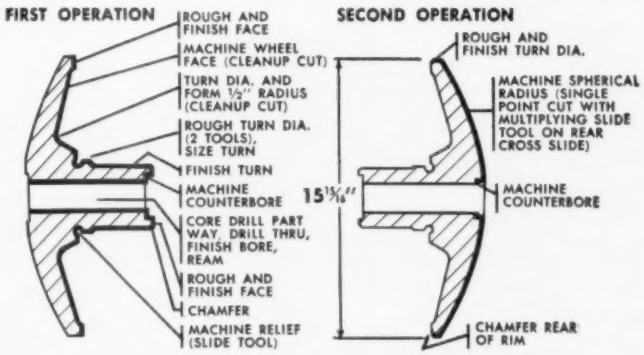


## A POTTER & JOHNSTON 4-U Automatic Chucking Turret Lathe can produce a part like this every 19.1 minutes!

**PART:** Transmission Wheel

**MATERIAL:** Nitralloy Steel Forging

**REQUIRED:** 2 Operations, a Total of 23 Separate Cuts including 2 Radii and a Relief Cut


FIRST OPERATION
ROUGH AND FINISH FACE
MACHINE WHEEL FACE (CLEANUP CUT)
TURN DIA. AND FORM ½" RADIUS (CLEANUP CUT)
ROUGH TURN DIA. (2 TOOLS), SIZE TURN
FINISH TURN
MACHINE COUNTERBORE
CORE DRILL PART WAY, DRILL THRU, FINISH BORE, REAM
ROUGH AND FINISH FACE
CHAMFER
MACHINE RELIEF (SLIDE TOOL)
SECOND OPERATION
ROUGH AND FINISH TURN DIA.
MACHINE SPHERICAL RADIUS (SINGLE POINT CUT WITH MULTIPLYING SLIDE TOOL ON REAR CROSS SLIDE)
15 15/16"
MACHINE COUNTERBORE
CHAMFER REAR OF RIM

*HEAVY LINES INDICATE MACHINED SURFACES*

## CAN YOUR PRESENT EQUIPMENT MATCH THIS PERFORMANCE?

Check your production records. If they don't measure up to the example shown above, you're missing important opportunities for faster output and bigger profits. It takes a truly modern machine like the P&J 4-U – with the extra power, speed, rigidity and versatility needed to handle tough alloys and complex cuts – to compete profitably in today's markets. You can't *afford* second-best equipment . . . so write now for full information on the finest. Ask for P&J Bulletin No. 158 describing the Potter & Johnston 4-U Automatic and including complete engineering data.

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SUBSIDIARY OF PRATT & WHITNEY COMPANY, INCORPORATED

MODERNIZE WITH POTTER & JOHNSTON . . . REPLACE FOR PROFIT

# LINDBERG INDUCTION UNIT IMPROVES HEAT TREATING PROCESSES AT J.I. CASE...

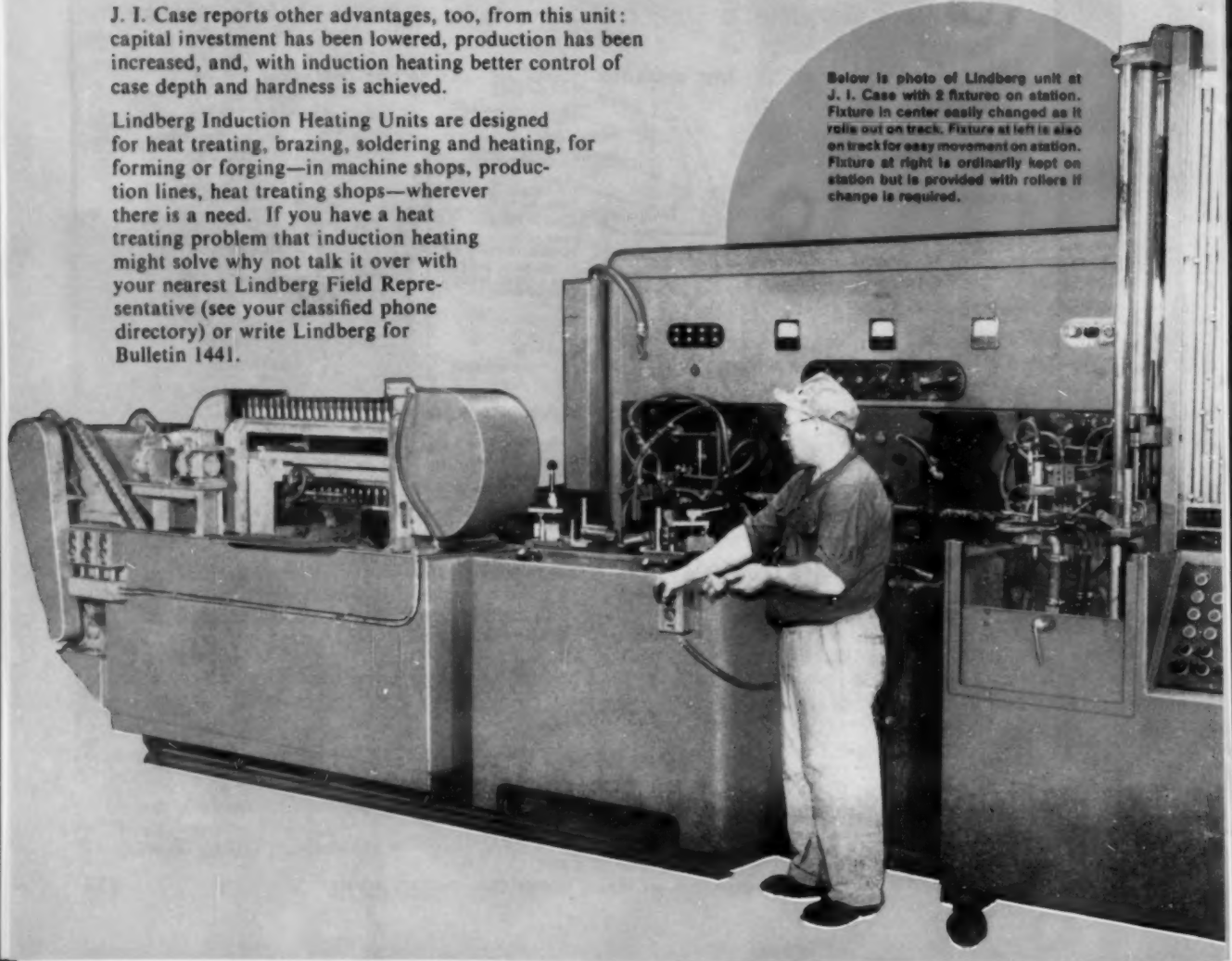
## SAVES ½ ITS TOTAL COST— *IN 1 YEAR!*

A single Lindberg 2-station High Frequency Induction Heating Unit at J. I. Case Co., Racine, Wisc., is providing a happy combination of sizeable cost savings and improved quality and production efficiency in heat treating parts for Case tractors. Actually, the dollar savings effected with this Lindberg unit will repay its total original cost in *less than 2 years!*

This single unit and the five work fixtures provided with it, working on 2 to 3 shifts, 5 days a week to meet production requirements, heat treat some 63 separate tractor parts. Work fixtures are readily changeable, set-up time is materially reduced, and because of the 2-station design, the unit can operate continuously while work fixture is being changed over on one station.

J. I. Case reports other advantages, too, from this unit: capital investment has been lowered, production has been increased, and, with induction heating better control of case depth and hardness is achieved.

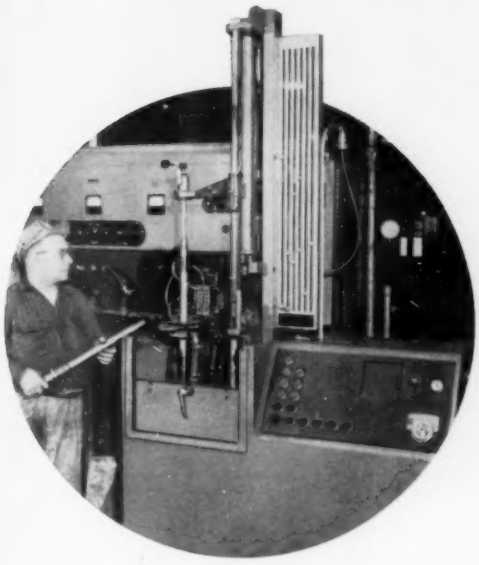
Lindberg Induction Heating Units are designed for heat treating, brazing, soldering and heating, for forming or forging—in machine shops, production lines, heat treating shops—wherever there is a need. If you have a heat treating problem that induction heating might solve why not talk it over with your nearest Lindberg Field Representative (see your classified phone directory) or write Lindberg for Bulletin 1441.



Below is photo of Lindberg unit at J. I. Case with 2 fixtures on station. Fixture in center easily changed as it rolls out on track. Fixture at left is also on track for easy movement on station. Fixture at right is ordinarily kept on station but is provided with rollers if change is required.

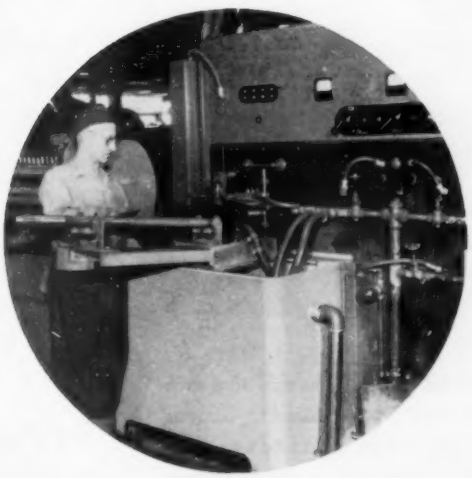
*(Above)* Hydraulic male coupling is being treated on this fixture. 3 other parts are treated by it, too.

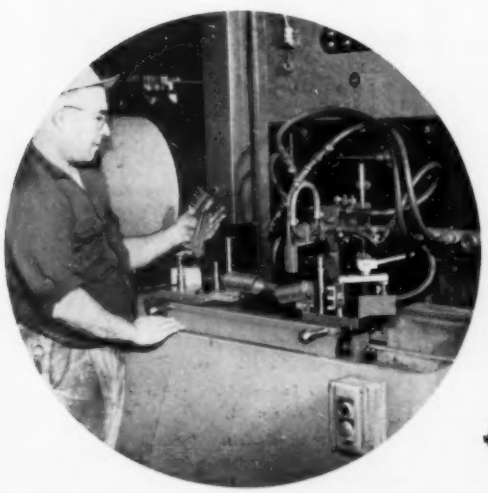
*(Below)* This fixture is shown selectively hardening a front axle king pin. It handles piece up to 45½" long, 35" of which can be scanned to desired depth. It is also used for 34 other parts.



*(Above)* This shows fixture handling inlet and exhaust valve rocker arms. Same fixture treats 6 other parts.

*(Below)* Power take-off hydraulic drive shafts are one of the 3 parts treated by this fixture.





*(Above)* This fixture is selectively hardening pads and slots on shifter forks. It is also used for treating 17 other parts.


LINDBERG

HIGH FREQUENCY DIVISION

Lindberg Engineering Company

2447 West Hubbard St., Chicago 12, Ill.

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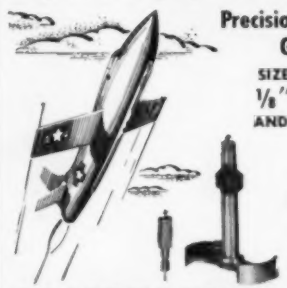

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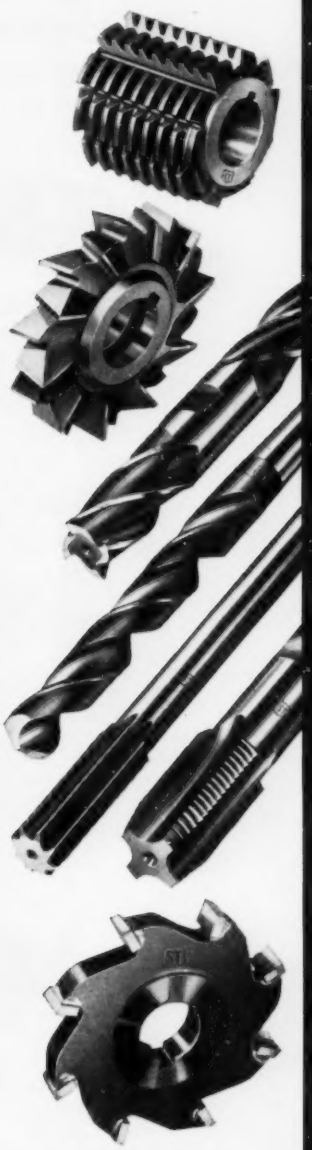

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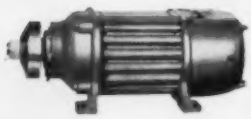
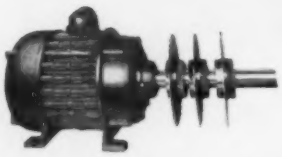
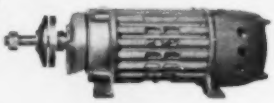


TYPE L ARBOR 1–30 H.P.
Flatted top or side for maximum cut.



TYPE G ARBOR 1–100 H.P.
Vertical or horizontal application.



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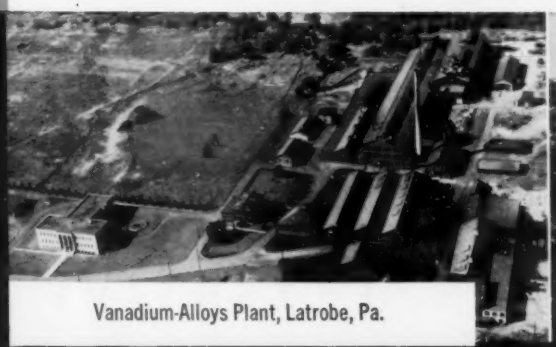
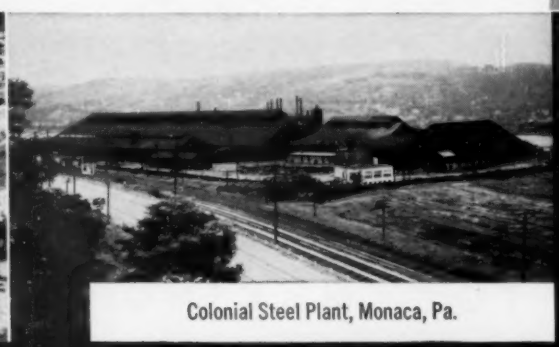
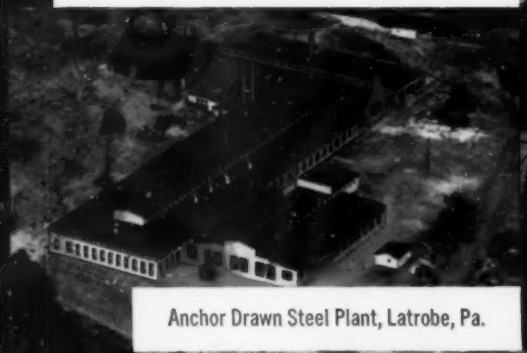


Vanadium-Alloys Plant, Latrobe, Pa.



Colonial Steel Plant, Monaca, Pa.



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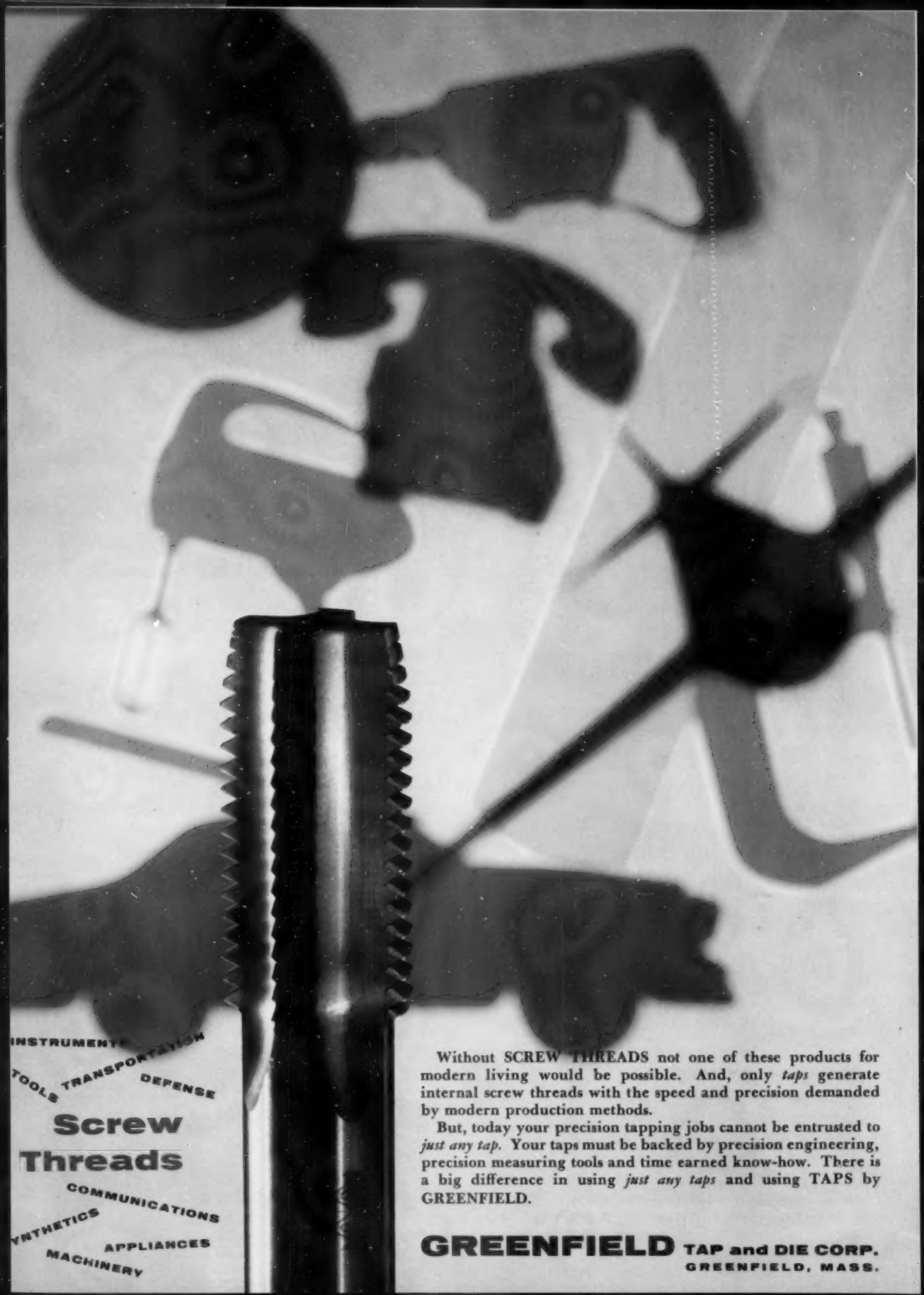


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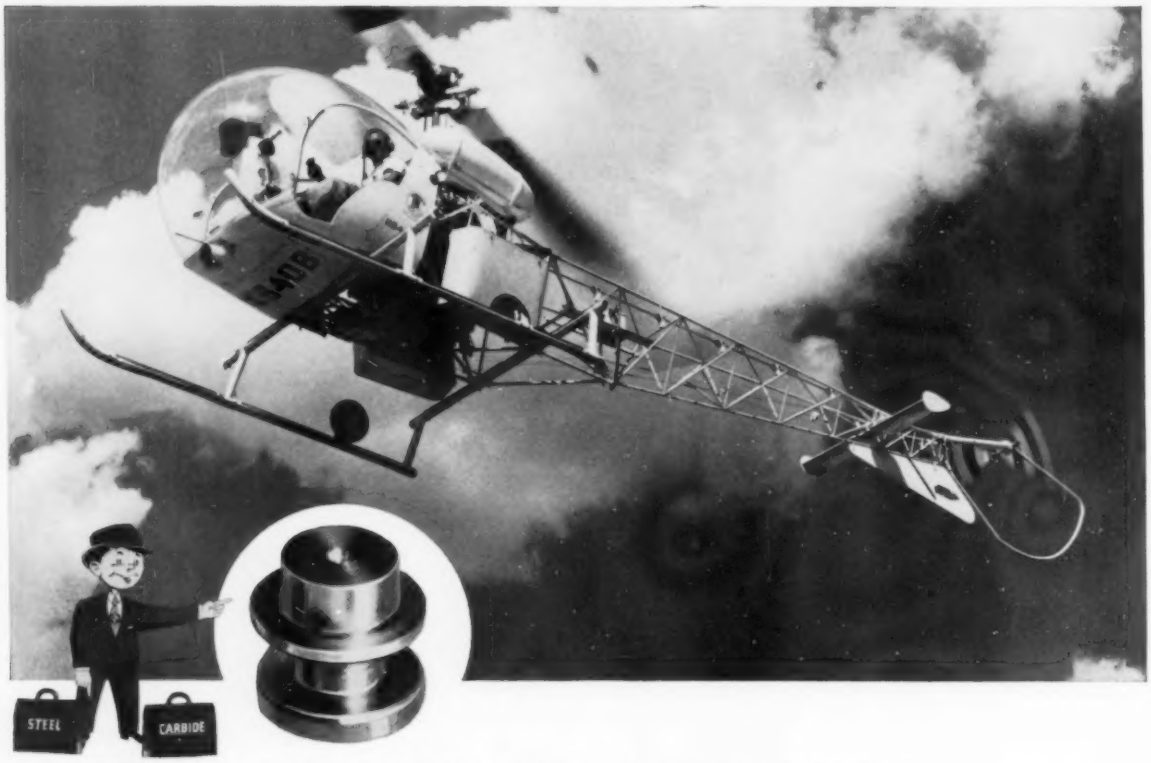


## 133% more needle bearing pins per grind

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The results speak for themselves:

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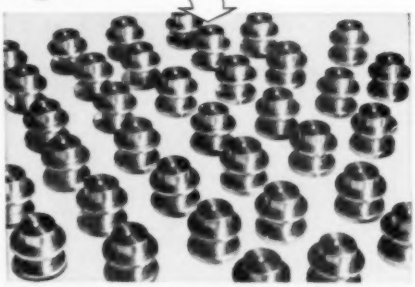
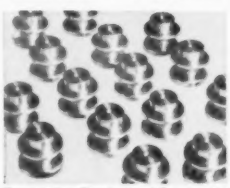


**FIRTHITE TXH—35 PER GRIND**



Competitive Grade A—15 per grind

Competitive Grades B & C—4-5 per grind

R 316

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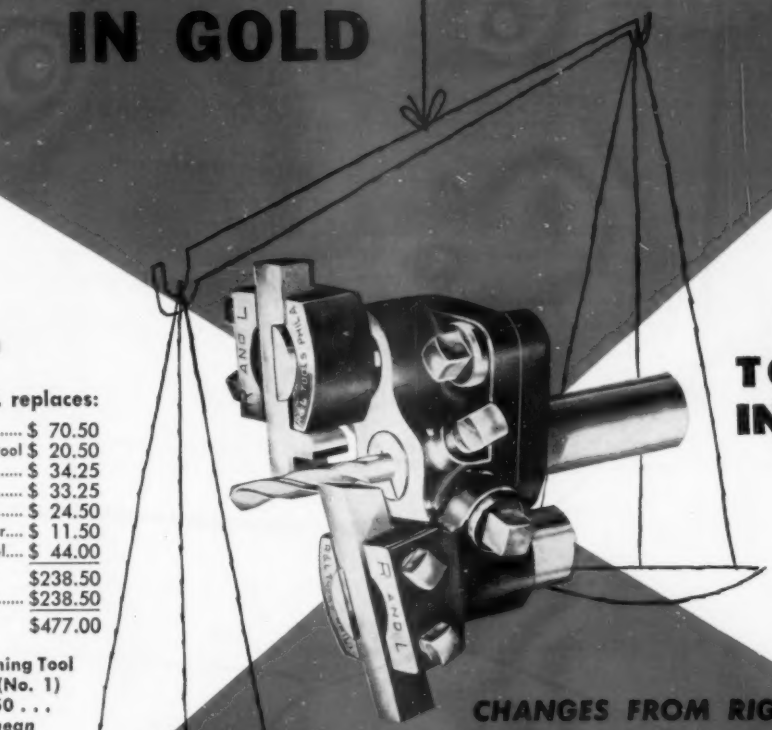

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| Same for left hand | $238.50 |
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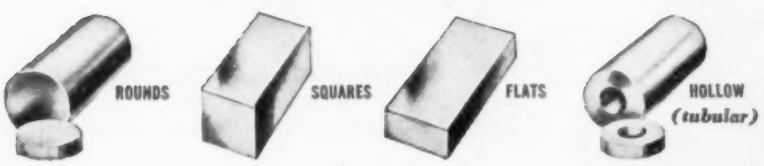


AM-35

*And Tool Steels Only*
*Complete Line of Tool Steels ∧ Wide Range of Sizes and Grades*

'PACKAGED' POWER FOR MODERN AUTOMATION

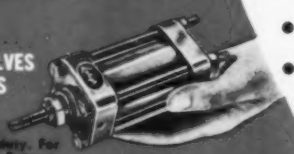
Lehigh

COMBINATION VALVES
Panel units, base and line operated valves. Wide range of models.

AIR CYLINDERS
1½" to 8" Bore "Sealed-in Lubrication"

3 or 4-WAY AIR POWERED VALVES
Air or electrically operated.

LEHIGH MINOR AIR VALVES AND CYLINDERS



Low priced, light duty. For air operated jigs, fixtures, high speed operations.

SEALED-IN LUBRICATION
PAT. PENDING

# RECIPROCATING AIR MOTORS

## DO IT THE EASY *Lehigh* WAY

Here is the basic 'push and pull' you need to convert any machine, tool or process to any desired degree of automatic operation on ordinary shop air. This combination of a Lehigh Heavy Duty Double Acting Air Cylinder and a built-in 4-way Lehigh Valve, provides a simple, rigid, compact power unit that can be close coupled to any equipment to provide any mechanical movement. Complicated panel boards, piping and controls are eliminated. Action is faster than with separate valves and cylinders — operating cost is demonstrably lower because there is no loss of air. Standard features include:

- Electric control either momentary or maintained. 110V-AC or low voltage.
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- Speed control in both directions. Cushion at both ends of cylinder.
- Automatic return stroke in one or both ends.
- Operation on air pressures of 5 P.S.I. to 200 P.S.I.
- Only one air inlet required. One exhaust.
- A wide selection of swivel, foot, nose, trunnion, flange and other mounting.
- Bores — 1½" — 2" — 3" — 4" — 5". Strokes: ½" to 72".

**Lehigh Air-Engineering service is available nationally through factory trained representatives.**

*Write for name of nearest distributor or complete descriptive catalogs.*

Lehigh INC.

**ENGINEERS AND MANUFACTURERS**
AIR CONTROL DIVISION
**1500 Lehigh Drive • Easton, Penna.**

A COMPLETE LINE OF AIR CONTROL EQUIPMENT

## If you've only seen MICROBORE® in advertisements

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by DeVlieg
... the Multi-purpose single point adjustable tool
for PRODUCTION BORING, TURNING and FACING OPERATIONS.
DE VLIEG OF DETROIT
brings you a new addition to the Famous Microbore Line OF PRECISION TOOLING
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Make it a point to visit the
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The DeVlieg Microbore exhibit will include a wide range of Precision Tooling for general purpose and production applications

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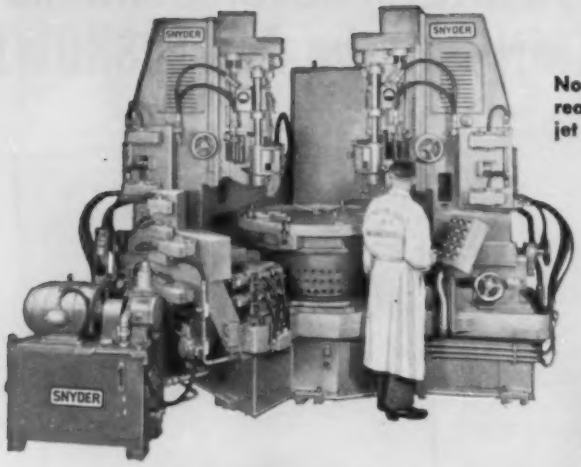
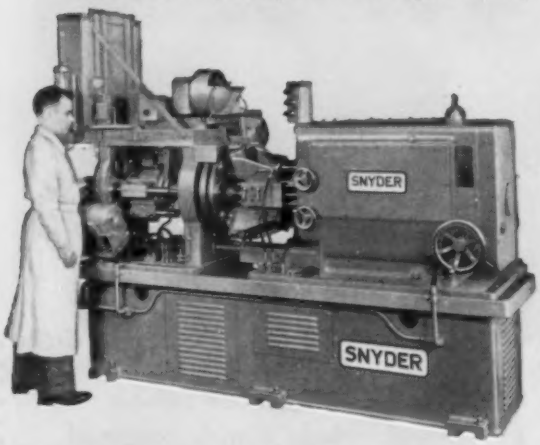
2720 West Fourteen Mile Rd., Royal Oak, Mich.



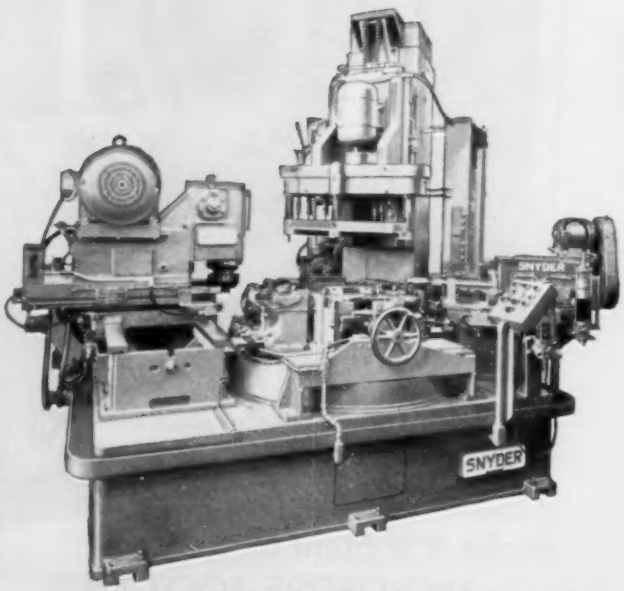

**No. 70165—Special index machine to drill and ream holes in rims of outer shroud spacers for jet engines. Production 2 parts per hour.**

**No. 65412—Special automatic machine, for weighing and precision balancing a variety of heavy-duty and diesel engine connecting rods from 7⅜" to 12" center distance. Weighs rods and automatically balance mills to plus or minus 2 grams.**

**No. 207390—Special, double-end precision boring machine for finish boring, counterboring and chamfering counter shaft, intermediate and shifter shaft holes on power take-off cases. Production 82 pieces per hour at 80% efficiency.**




**No. 68526—Special double end trunnion machine, fully automatic, for machining special aircraft rivets. Machine is automatically loaded and unloaded. Production rate varies with size of rivet.**




**No. 73902—Special 4-station automatic index machine for milling joint face, drilling and reaming vertical and horizontal holes in exhaust manifolds. Production 80 pieces per hour at 80% efficiency.**

# SNYDER VERSATILITY

**in engineering and building metal-cutting machines includes not only the great Snyder line transfer machines with automation, but also many smaller and diversified machines in which the standards of performance and economy are no less exacting. A few representative examples are shown.**

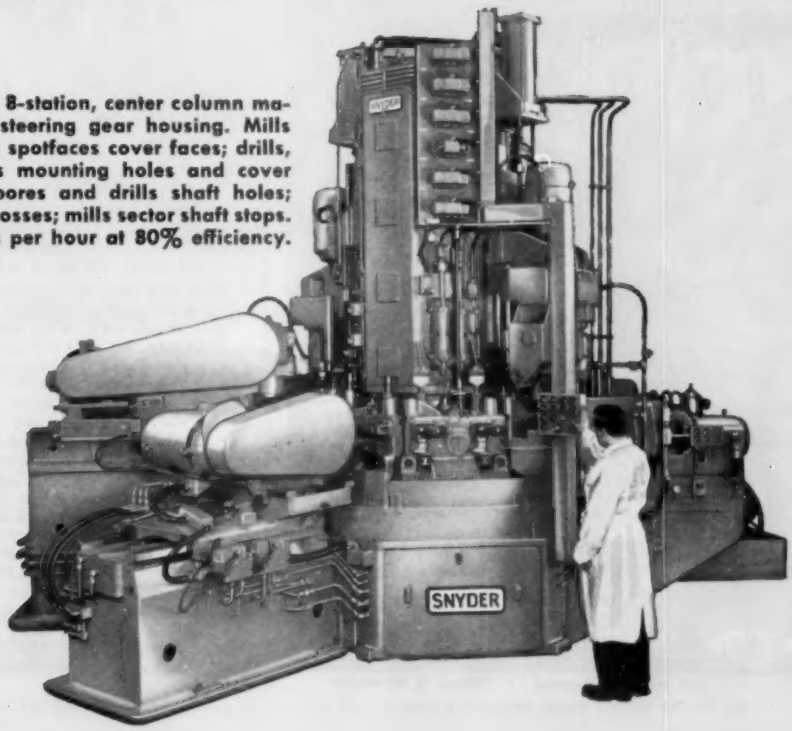
# SNYDER

## TOOL & ENGINEERING COMPANY

**3400 E. LAFAYETTE • DETROIT 7, MICHIGAN**

*31 Years of Special Machine Tools with Automation*

**No. 72976½—Special 8-station, center column machine for processing steering gear housing. Mills pads and cover faces; spotfaces cover faces; drills, countersinks and taps mounting holes and cover holes; rough counterbores and drills shaft holes; mills two Welch plug bosses; mills sector shaft stops. Production 260 pieces per hour at 80% efficiency.**



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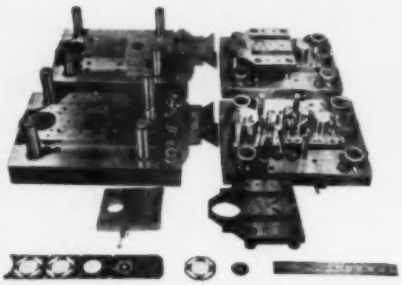
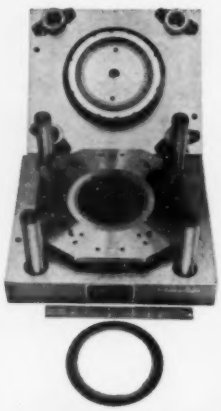
**25 YEARS DIVERSIFIED EXPERIENCE IN DESIGNING AND MANUFACTURING COMPOUND & PROGRESSIVE LAMINATION DIES**

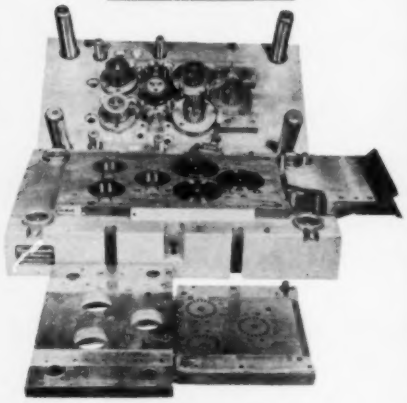
*SEND PART PRINT FOR QUOTATION*

**TUNGSTEN CARBIDE—HIGH CARBON — HIGH CHROME**

**SPECIALISTS IN THIS FIELD OF DIES**







TUNGSTEN CARBIDE | HIGH CARBON HIGH CHROME | TUNGSTEN CARBIDE

## COMMANDO TOOL INC.

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DETROIT 20, MICH.

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**MIDGET-U**
(MODEL 215-U)
**TOGGLE CLAMP!**

*. . . with articulated linkage and low closed-silhouette . . .*

Midget-U is an ideal tiny clamp for light-duty jobs requiring almost effortless positive clamping. . . . It has limitless applications for clamping metal, plastic and wood parts . . . Weighs only 4 oz. . . . Delivers 150 lbs. holding pressure. . . . Total length when closed—5⅞"!

**OPEN POSITION** shows fine articulated linkage of components.

**CLOSED POSITION** shows its low silhouette

*Send for Literature on this new DE-STA-CO Midget-U Toggle Clamp!*

DE-STA-CO **DETROIT STAMPING COMPANY**
WORLD'S FIRST LINE OF TOGGLE CLAMPS

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Patents Pending.

*Em-re*
**PRECISION**
**DIAL INDICATORS**
**THE MOST ACCURATE MADE**

Some time ago, we recognized the need for a dial indicator with greater accuracy . . . So, using the finest tools, materials and workmanship that money could buy, we began building the "Em-re."
The result, a fully-jeweled, precision dial indicator that will consistently (after millions of checking operations) give *repeated*, accurate readings — surpassing A.G.D. tolerances. Furthermore, this is the *only* 100% shockproof mechanism on the market . . . Stocked in 24 models having 6 ranges from .025" to .250" with graduations in .00005", .0001", .00025", .0005" and .001".

**See this new line of indicators in Booth 910 ASTE SHOW CHICAGO March 19-25**

or
**Send today for Bulletin 455-D.**

**PETZ-EMERY INC.**
PLEASANT VALLEY, NEW YORK

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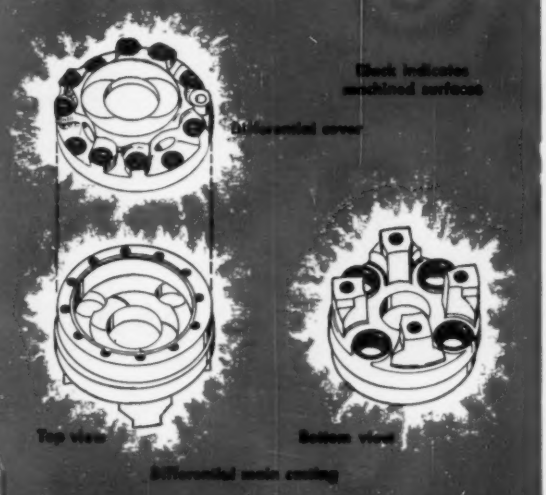
# CUSTOMER SPECIFIED

**Customer specified a multi-purpose production machine to perform 12 operations in sequence on both the main casting as well as the cover of a differential housing.**




# KEARNEY & TRECKER DESIGNED

Kearney & Trecker designed this new 88-spindle drilling and tapping machine to complete 134 pieces per hour, 67 covers and 67 main castings.

Machine features rugged columns which provide rigid support . . . and exacting accuracy. Five fixtures, each holding three workpieces, are mounted on a standard Kearney & Trecker 60" rotary index table. Machine employs three vertical drilling heads, each counterweighted. First head has 48 spindles and performs drilling, counterboring, flat bottom drilling and chamfering. Second head carries 28 spindles and handles spotfacing, reaming, boring and trepanning operations while head No. 3 with 12 spindles does tapping operations.

## New production efficiency starts with Kearney & Trecker Milwaukee machine tools

This new machine proves that you can rely on Kearney & Trecker's Special Machinery Division to give you the highest production possible at lowest cost. Because with more than 50 years' experience in machine design and manufacture, Kearney & Trecker Corp. has all the ingenuity and skill required to solve high production machining problems.

Why don't you take advantage of our abilities? They can pay off in profits for you. Our representative will be pleased to give you all the details. Contact him today, or write Kearney & Trecker Special Machinery Division, 6772 W. National Ave., Milwaukee 14, Wisconsin.

*For more details on the machine illustrated ask for Data Sheet No. 1052. Also, free booklet "Doorway to a proven method for solution of big and small metalworking problems" is yours for the asking.*

***Builders of Precision and Production Machine Tools Since 1898***



FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-3-373

# AUTOMATION WITH ARO PAR-A-MATIC DRILLS

## Speeds Drilling for Tecumseh Products Co.

Drilling six holes at a time in a compressor piston with ARO Par-A-matic Drills helps Tecumseh Products Co., Tecumseh, Mich., increase output, reduce man-hours.

A group of Par-A-matics will drill any number of holes simultaneously . . . often in *less time* than would be needed for a single hole. Set-up adjustments are fast and easy. Air-operated . . . adjustable stroke length . . . variable rate of feed. ARO Field Engineers offer full assistance in planning multiple Par-A-matic installations. Write for bulletin 5546-T.

**THE ARO EQUIPMENT CORPORATION**
**Bryan and Cleveland, Ohio**
Aro of California, Los Angeles 7, California
Aro Equipment of Canada, Ltd., Toronto 15, Ontario
*Offices in All Principal Cities*

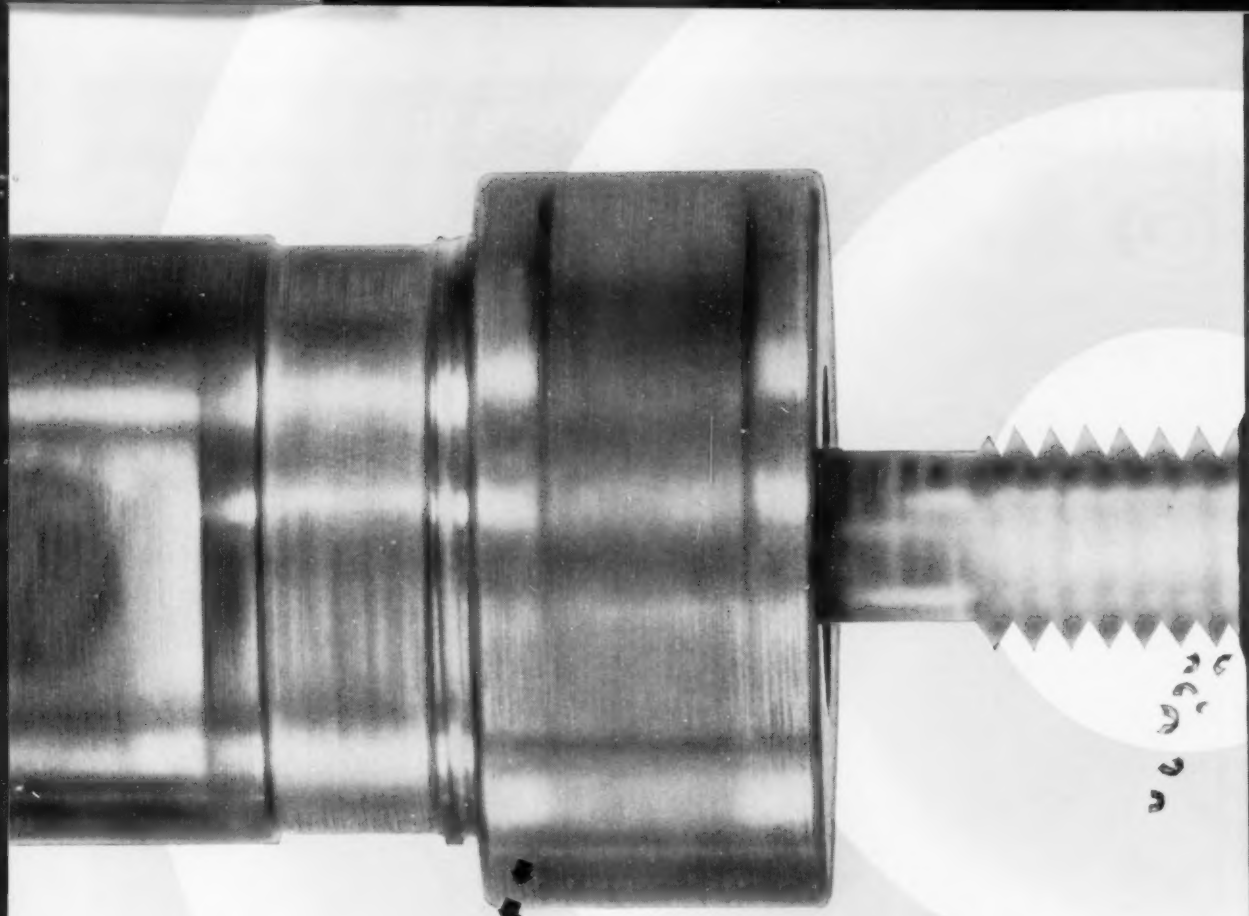
**IN ACTION**
**AT THE ASTE SHOW**
**BOOTH 638**

See the new ARO Par-A-matic and cutomatic drills . . . the new multiple nutsetter . . . the new link chain hoist and other ARO tools.

**ARO** ®

**AIR TOOLS**

Also . . . AIR HOISTS . . .
LUBRICATING EQUIPMENT . . .
AIRCRAFT PRODUCTS . . .
GREASE FITTINGS



# Tops for Taps... it's a *Jacobs* CHUCK

Jacobs and your industrial supply distributor are ready to deliver the chucks you need and the service you deserve. First in chucks... first in service.

**THE JACOBS MANUFACTURING COMPANY • WEST HARTFORD, CONN.**

The Jacobs Model 91 Spindle Nose Collet Chuck for tool room and engine lathes.

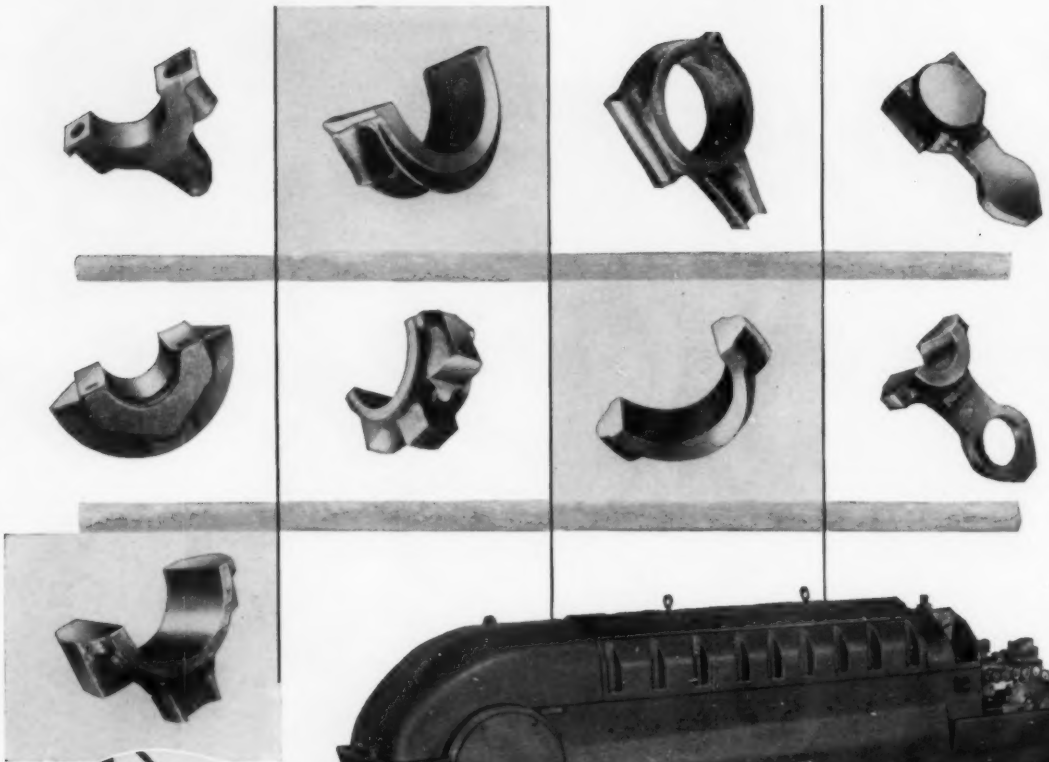
The Jacobs Rubber-Flex® Tap Chuck for tapping heads and impact tools.

The Jacobs Model 96 Collet Chuck for grinding machines, millers and jig-borers.

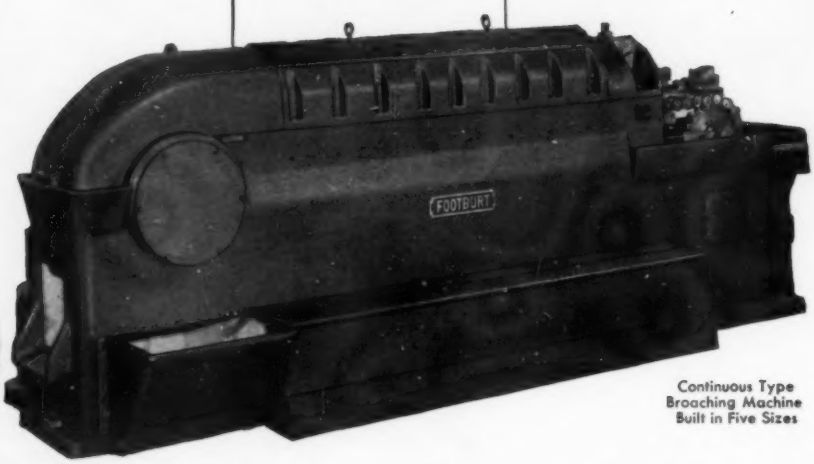
The Jacobs Ball Bearing Super Chuck for heavy duty and precision industrial use.

The Jacobs Plain Bearing Chuck for drill presses, portable electric and air tools.

The Jacobs Impact Keyless Chuck especially designed for the aircraft industry.



Holding Fixtures are designed for quick, convenient loading, with automatic clamping, unclamping and unloading.




Continuous Type Broaching Machine Built in Five Sizes

**machining connecting rods and caps an opportunity for**

*Surface Broaching*

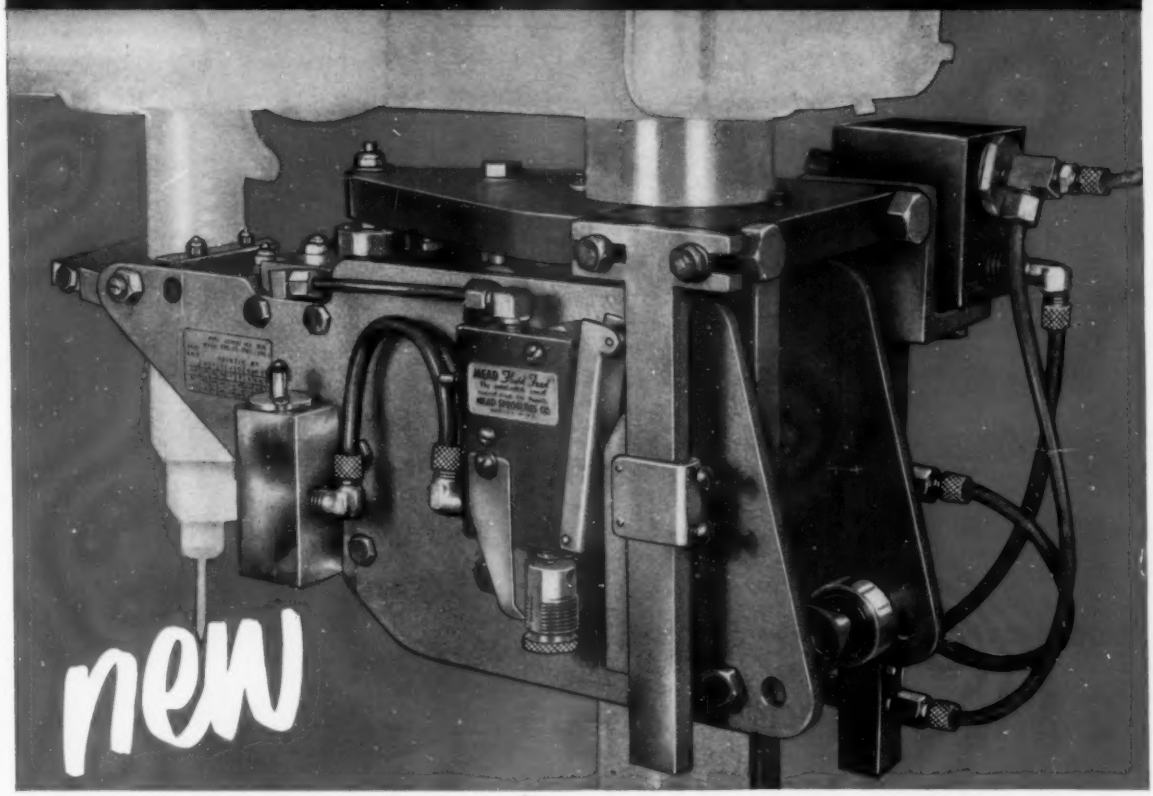
■ Surface Broaching is a modern machining method that in many cases shows reduced costs through higher production, finish to closer tolerance, and low tool maintenance costs. If you machine large quantities of duplicate parts we will be glad to work with you on the possibility of adopting Footburt Surface Broaching Machines. Send us blueprints and hourly production requirements for our recommendations.

**THE FOOTE-BURT COMPANY**
**Cleveland 8, Ohio**
Detroit Office: General Motors Building

# FOOTBURT

**PIONEERS IN SURFACE BROACHING**

# Fluid Feed AIR-HYDRAULIC DRILL PRESS FEED!




## with Predictable Speed Control!

***EXCLUSIVE NEW OIL-FLOW PRINCIPLE ADJUSTS RATE OF FEED ACCURATELY FROM 2 INCHES TO 60 INCHES PER MINUTE... Combines Even Steady Hydraulic Feed with Economical, Dependable Air Power!***

*Learn how Mead's exclusive new oil-flow principle provides pre-selection of feed speed accurately from 2 to 60 inches per minute yet is adjustable during operation — how the usual needle valve and air bubble troubles are eliminated—how steady, even hydraulic control combines with economical, dependable air power to give faster, easier, better production.*

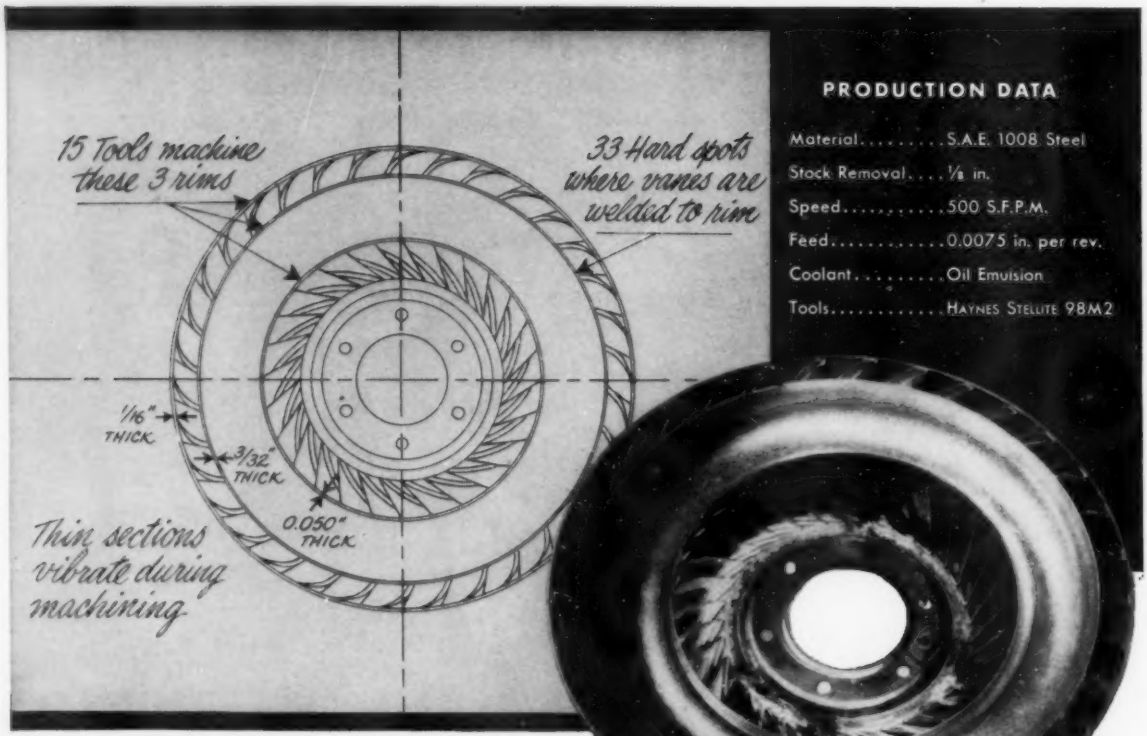
See it working at BOOTH 215 ASTE INDUSTRIAL EXPOSITION Chicago, March 19-23

### Write Now!

It will pay you to write factory or nearest Mead Representative (listed in Thomas' Register) for special 4-page folder plus Catalog of other Mead units suitable for automation with this remarkable new Fluid Feed Air-Hydraulic Drill Press Feed! Write now!

**PATHFINDER IN AIR POWER AUTOMATION**

**MEAD**
**SPECIALTIES COMPANY**
DEPT. T-36, 4114 N. Knox Ave.,
CHICAGO 41, ILLINOIS




# 2 MILLION weld areas machined per grind

HAYNES STELLITE 98M2 tools machine 1,000 of these torque converter turbine wheels between grinds. Fifteen tools are used to machine the three rims. There are 33 weld areas on one of the rims where the vanes are joined to it. On every revolution a HAYNES STELLITE tool cuts through these hard spots. It makes 2,100 interrupted cuts per wheel . . . over two million per grind. In addition, all 15 tools must withstand the shock set up by vibrations of the thin sections.

The parts are double indexed on an automatic lathe at six stations. Spindle speed is about 160 revolutions per minute. Feed rate is 0.0075 in. per revolution. Machining speed is 500 surface feet per minute. Total machining time per turbine is 28 seconds, and approximately 125 wheels are finished in an hour. The HAYNES STELLITE tools operate for a full eight-hour shift without chipping or spalling.

HAYNES STELLITE tools have an unusual combination of red hardness and toughness. They remove metal fast because they can take deep cuts at heavy feeds. For full details write for the booklet, "HAYNES STELLITE Metal-Cutting Tools."

HAYNES TRADE-MARK ALLOYS

**HAYNES STELLITE COMPANY**

**A Division of Union Carbide and Carbon Corporation**

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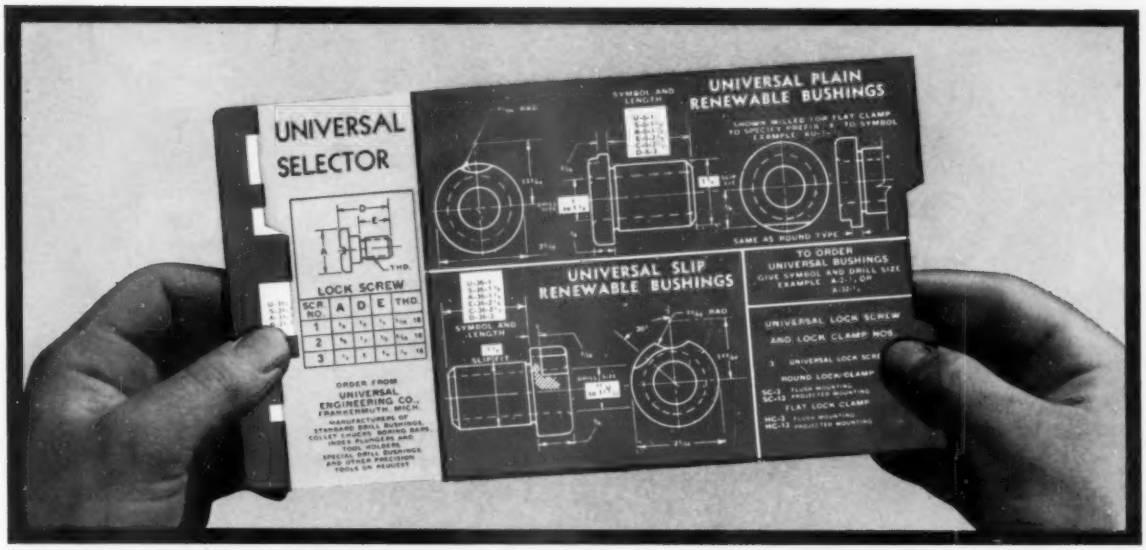
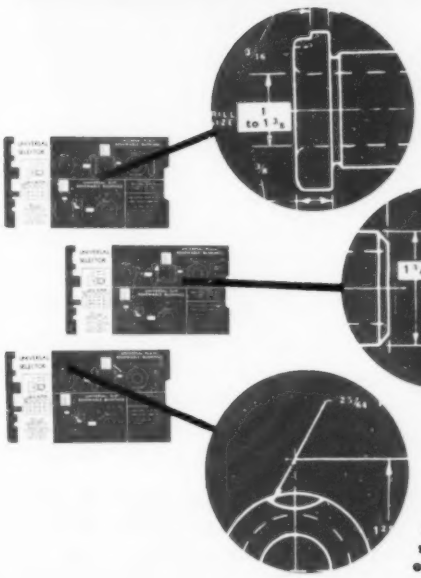
*"Haynes," and "Haynes Stellite" are registered trade-marks of Union Carbide and Carbon Corporation.*

# HOW THE UNIVERSAL DRILL BUSHING SLIDE CHART SIMPLIFIES JIG DESIGN

**new plastic, pocket-size calculator gives all engineering data for the selection of all types and sizes of drill jig bushings up to 1¾" drill size**



The SELECTOR is divided into four areas, one for each of the four types of bushings. The example shown here is for the plain renewable. Using this area, you move the slide until the correct drill size appears in the drill-size window.

Once the drill size is set up on the SELECTOR, all other factors now appear in the windows. This section, for example (shown actual size) shows correct bushing O.D. and dimension from center to flat for clamp.

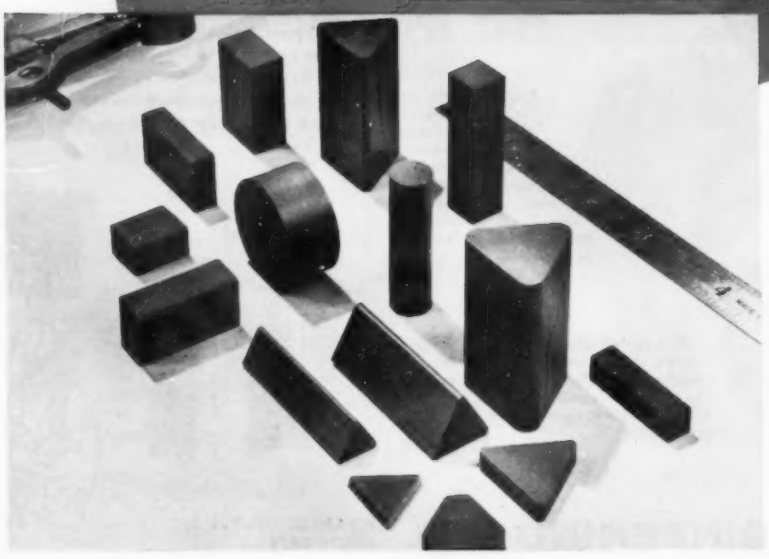
This section shows the radius for lock screw. Every factor you need for drill bushing jig design as well as for ordering the correct bushing to fit that design is shown correctly, exactly, and at a glance on the SELECTOR.

A new service to regular users of drill jig bushings is this extremely practical plastic Selector slide-chart. When designing jigs, you will save many hours, and be certain of your accuracy, with the SELECTOR. It represents the result of six years experimentation and research by Universal Engineering Co. If you are an engineer specifying bushings and do not have one of these slide calculators—you can have one for your own design work by simply requesting it on your company letterhead. Don't wait—do it today!

193

**UNIVERSAL ENGINEERING CO.** FRANKENMUTH 3, MICHIGAN

# Announcing a new high strength oxide cutting tool



See STUPALOX Tools demonstrated at Booth 1309, ASTE Industrial Exposition, Chicago, March 19-23.

# Available in commercial quantities NOW!

# STUPALOX

## Outperforms other cutting tools TWO TO TEN TIMES!

Deeper cuts, faster speeds, high surface finish and longer tool life are obtained by using STUPALOX cutting tools. Compared with other commercial tools in field tests under a variety of actual operating conditions, STUPALOX outperformed the best of these tools *two to ten times!* The limiting factor in many test demonstrations was the power and rigidity of the machine tool.

The perfection of STUPALOX is the climax of more than thirty years of oxide application development by Stupakoff, a leader in the field of technical ceramic materials. Extensive research and engineering studies, and broad manufacturing experience have been focused on the development of STUPALOX.

STUPALOX is available *now* in commercial quantities, and in a variety of sizes and shapes. We will be glad to send technical data. Use the coupon.

**Stupakoff** DIVISION OF **The CARBORUNDUM Company** | LATROBE, PENNSYLVANIA

*Send for Bulletin*

It gives production figures with Stupalox tools, physical and mechanical properties and operating data.

(TE)

STUPAKOFF Division of
The Carborundum Company
Latrobe, Pennsylvania

Please send a copy of STUPALOX Bulletin No. 156 to:

Name_____ Position_____

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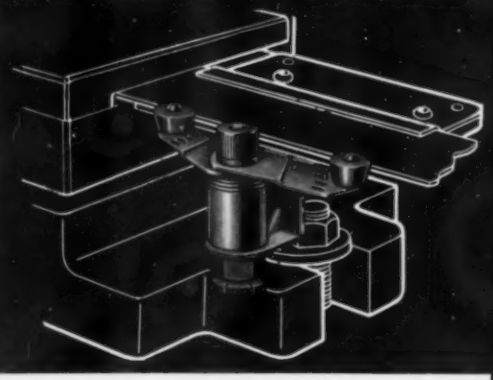
# NOW...
## A Low-Cost Stock Guide



### NEW DANLY ROLLER STOCK GUIDES AND GUIDE RAILS

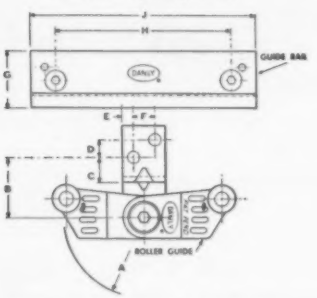
*READY MADE—QUICK TO INSTALL*

**Versatile**...for use on dies or in any operation where coil or strip stock must be guided.

**Low-cost**...the cost is only a fraction of the shop expense necessary to tailormake a guide.

**Rugged**...constructed entirely of steel. Rollers, arms, collar and bracket are hardened. Adjustable, three-coil music wire spring.

Roller Guide, Large.....$4.50 each
Roller Guide, Small.....4.00 each
Guide Rail.....$3.50 box of five (all one size)
*(Discount for quantity orders)*




**Roller Guide Dimensions, Inches**

| | Cat. No. | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| Roller Guide Large | 9-70-6 | 2 3/64 | 1 13/32 | 3/8 | 1/4 | 5/16 | 7/16 |
| Roller Guide Small | 9-60-6 | 1 27/64 | 1 1/16 | 7/16 | 5/16 | 3/16 | 3/8 |

*Danly Roller Stock Guides packed one to a box unassembled, furnished with light or heavy-duty spring for optional use plus all necessary mounting screws and mounting instructions.*

**Guide Rail Dimensions, Inches**

| | Cat. No. | Max. Stock Thickness | G | H | J |
|---|---|---|---|---|---|
| Guide Rail | 9-8025-6 | .025 | 1 | 3 1/8 | 4 |
| | 9-8045-6 | .045 | 1 | 3 1/8 | 4 |
| | 9-8080-6 | .080 | 1 | 3 1/8 | 4 |
| | 9-8125-6 | .125 | 1 | 3 1/8 | 4 |

*Danly Guide Rails packed five of one size per box, furnished with mounting screws and dowel pins.*

*For immediate delivery, specify catalog number and mail orders to*

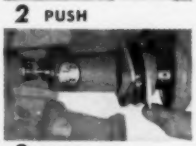
**DANLY MACHINE SPECIALTIES, INC.**
2100 South Laramie Avenue • Chicago 50, Illinois

USE READER SERVICE CARD; INDICATE A-3-382-1

# *Wait!* Don't Throw Out Those WORN DRILLS!

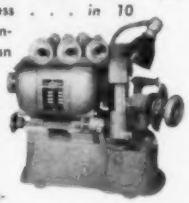
1 INSERT

2 PUSH


3 TWIST

4 GRIND

The BLACK DIAMOND Drill Grinder restores a worn drill to like-new precision sharpness . . . *in 10 seconds!* Any inexperienced man (or woman!) is an expert grinder with this unit. Both lips ground at once . . . web-thinning equally simple! Pays for itself many times over!



Also manufacturers of the Worcester Drill Grinder for drills up to 2½".

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**BLACK DIAMOND**
SAW & MACHINE WORKS
NORTH AVE. NATICK, MASS.

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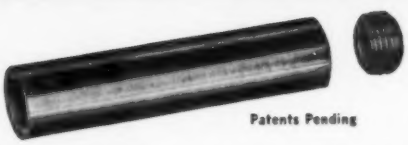
# *How* SQUARE HOLED SLEEVES SPEED UP TOOL-MAKING!



Patents Pending

One of the most difficult problems in tool making can be solved easily and quickly with Sturdy Square Holed Sleeves. The perfection of broached square holes can be had in boring bars, milling cutters and many other applications at a small fraction of the cost of imperfect hand-made square holes. The sturdy Square Holed Sleeve consists of a round sleeve with a perfectly square hole broached through the center. This hole is tapped at one end to receive a back-up screw which is furnished with the Sleeve. The Sleeve can be sweated or pressed into a drilled and reamed hole to make a perfectly square accurate hole in a very few minutes.

The Sturdy Square Holed Sleeve will save you many hours and many dollars in the making of boring bars, tool holders and other tools requiring square holes.

SLEEVES MADE IN FOLLOWING SIZES:
3/16, ¼, 5/16, ⅜, 7/16, ½, ⅝, ¾, 1"

**STURDY BROACHING SERVICE INC.**
23520 TELEGRAPH RD., DETROIT 19, MICH.

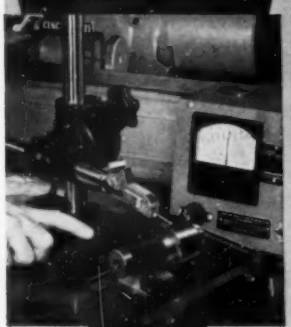
*Write for Literature*

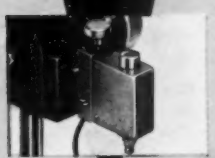
USE READER SERVICE CARD; INDICATE A-3-382-3

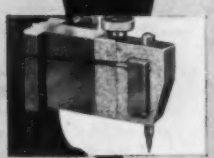
CI*

# *Electronic Gaging Equipment for greater accuracy, greater flexibility*

CI electronic gaging equipment covers a wide range of uses — from gage room work to production gaging and quality control. Accuracy and versatility are distinguishing features. CI equipment can measure dimensions in half-millionths of an inch . . can be used to check runout, concentricity, roundness, flatness, etc. There's a CI electronic comparator available (many can be used with recorders) to put real meaning in the quality of your quality control program.







## INDI-AC

Electronic indicator for surface plate work and for checking setups and runout on machine. Dual-scale amplifiers; readings to .000010" per division, or smaller on special order.

## PAR-AC

Electronic production gage for high-precision repetitive dimensional gaging. Dual-scale amplifiers; readings to .000010" per division, or smaller on special order.

## MICRO-AC

Electronic microcomparator for gage room use and ultra-precision gaging. 2 amplifier scales give readings to an accuracy of .0000005" (½-millionth inch) per division.

## AUTOSORT

Unit above automatically gages pitch diameter of double-threaded studs, sorts them into 4 categories. Other models available to gage and sort cylindrical parts by .000050" increments at speeds up to 3600 parts per hour.

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**March 19-23**

LABORATORY PRECISION IN PRODUCTION GAGING

**CLEVELAND INSTRUMENT** COMPANY, INC.
735 Carnegie Avenue • Cleveland 15, Ohio

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**(Standard on Miller Cylinders at no extra cost)**

**Specify CASE HARDENED CHROME PLATED PISTON RODS**
On all Air and Hydraulic Cylinders

***Benefits To You***

CASE-HARDENED Piston Rods (52-54 Rockwell "C") provide practically complete protection against damage from hammer blows, wrench-dropping, mishandling, and similar occurrences. ***Available from Miller at no extra cost.***

The HARD CHROME PLATING over the case-hardened rods protects against scratch-damage and rust. ***Available from Miller at no extra cost.***

**Specify "TEFLON" WIPERS**
On all Air and Hydraulic Cylinders

***Benefits To You***

"TEFLON" Rod Wipers and "TEFLON" Hydraulic Piston Rod Seals withstand temperatures from—100°F. to plus 500°F. They are impervious to practically all known chemicals, including the fire-resistant, special, and standard hydraulic fluids in current use. ***Available from Miller at no extra cost.***

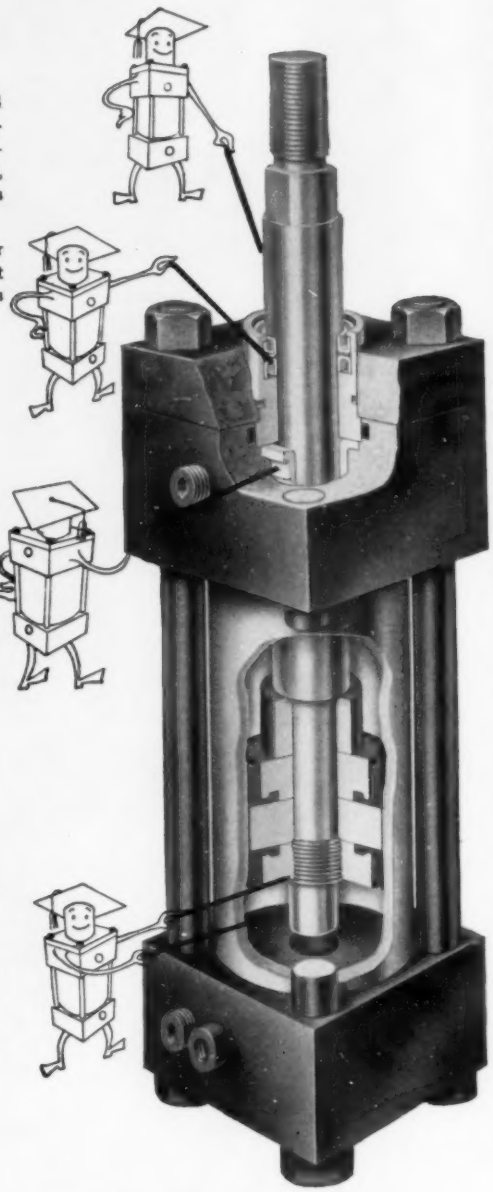
**Specify TEFLON HYDRAULIC ROD SEALS**
On all Hydraulic Cylinders

**Specify RUST RESISTANT SURFACES**
On all Air and Hydraulic Cylinders

***Benefits To You***

Highest quality Black Ferric Oxide Finish provides rust protection in air cylinder operation and on all cylinders during shipping and installation.

Cylinder heads, caps, mountings, pistons, followers, tie rods, and the unplated portions of the piston rods have this finish ***at no extra cost on all Miller cylinders.*** (This finish not recommended for water service)



*You may wish to route this entire page to the proper department in your company, by using this handy form. Additional copies on request.* →

To (Dept.)_____

**"On all our future cylinder requirements, please specify the above quality features."**

Signed_____

Title_____

*See These New Features on Miller Cylinders at Miller*

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AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
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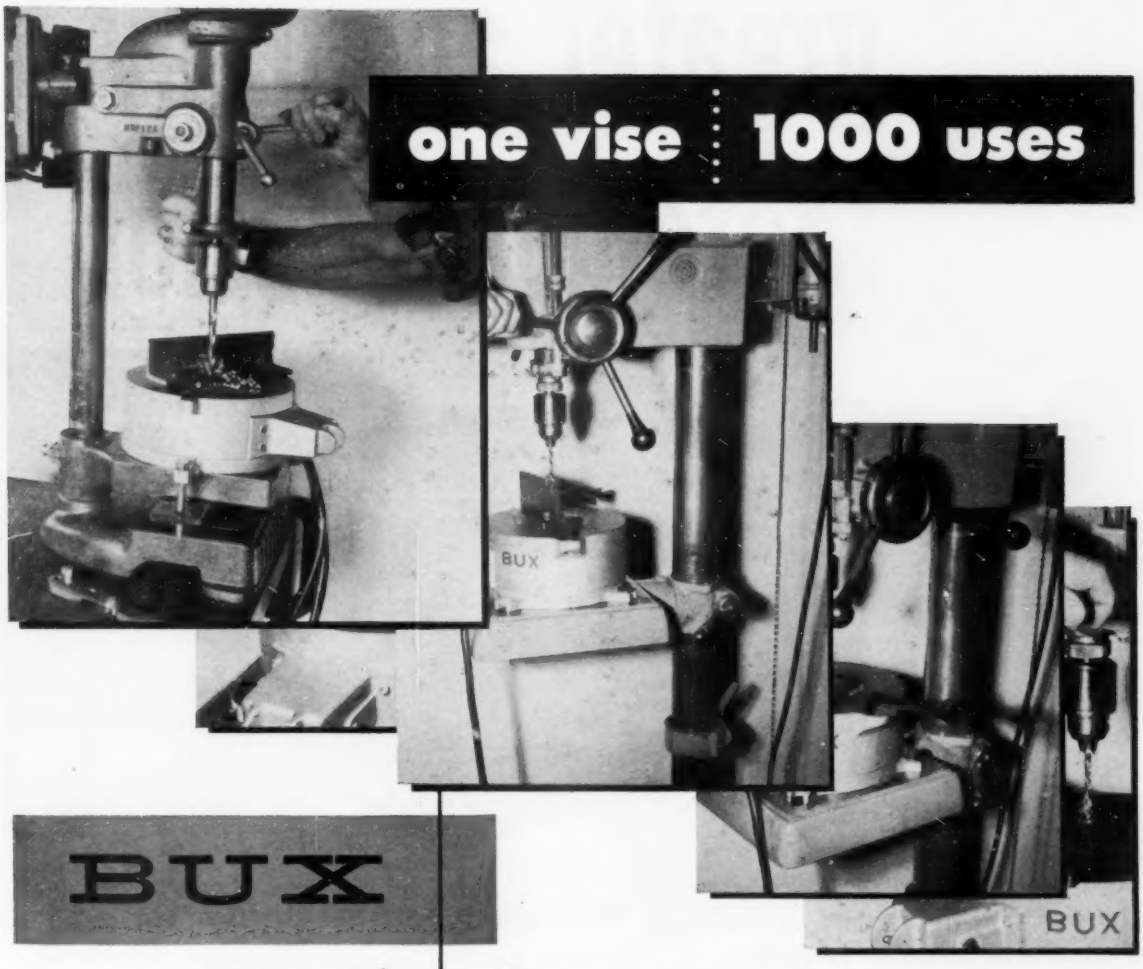


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## magnetic vise

BUX magnetic vise $235 list.*

A flip of a switch can now make a drill meet almost any drilling need. The flip of a switch on the revolutionary BUX **magnetic** vise. BUX holds your job in the unwavering jaws of a tremendously powerful magnetic field.

For production drilling, the two locating arms adjust just once, and are then held in perfect position for the duration of the run. How easily this is done, how easily and how certainly BUX can cut hours upon hours from your production time is a story too valuable to miss. Get it from your BUX dealer. Today is none too soon. Call him now, or send the coupon for fully descriptive information. BUX magnetic products also include portable magnetic drill presses adaptable to ANY standard portable drill, and portable magnetic plate clamps for use in welding heavy steel plates.

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Please send us complete literature about the new BUX magnetic drill vise along with the name of our BUX dealer.

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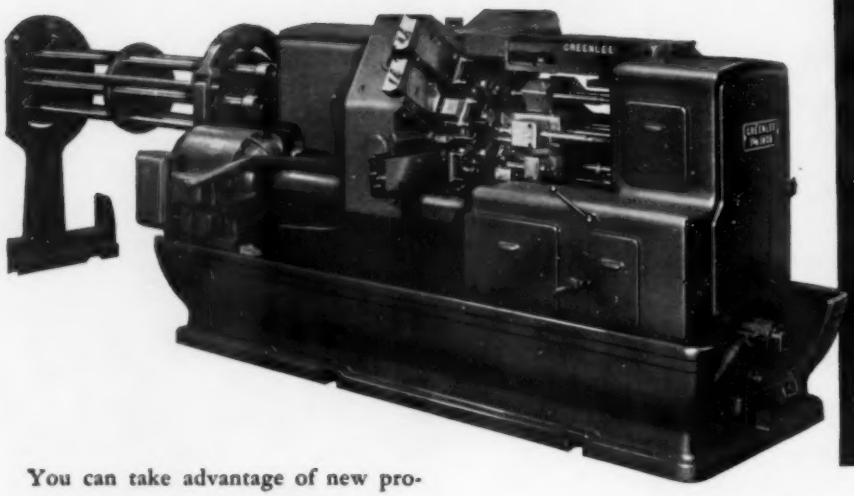
# now... greater accuracy, faster production



**WITH GREENLEE SIX-SPINDLE AUTOMATICS**

You can take advantage of new production techniques...attain higher levels of efficiency with the improved Greenlee 6-Spindle Bar Automatic. Its advanced design opens the door to some real profit opportunities. • These design improvements are fully described in a catalog recently issued. Let us send you a copy today. Find out how Greenlee Automatics can save time and money in your plant. It will pay you to investigate.

### IMPROVED SPINDLE CONSTRUCTION

The spindle has been completely redesigned to assure greater accuracy at higher speeds. True running... the new Greenlee spindle has five widely spaced, preloaded, angular-contact, precision ball bearings. Entire spindle is dynamically balanced for smooth operation. Metallic seals, labyrinth and friction washers with line contact provide maximum heat dissipation.

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Spindle speed range has been increased. Enables you to take full advantage of the top efficiency and peak performance which carbide and high-speed tooling offer. Reduces down-time losses and tool costs.

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**Rockford, Illinois**

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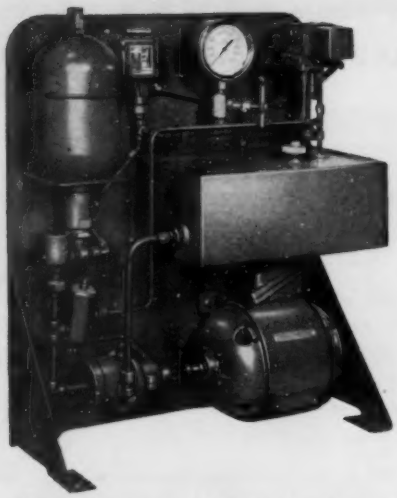
*Standard?*



*Panel mounted package?*

*Hi-lo double pump?*

**RIVETT can supply the exact power unit to meet your requirements!**

**STANDARDS** are available in 17 models at continuous working pressures up to 1000 P.S.I. and 1500 P.S.I. Single pumps are offered in six tank sizes. Capacities from .4 to 40 G.P.M. Double pumps are offered in four tank sizes with combined capacities from 3.5 to 80 G.P.M.

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**See Rivett Power Units at Booth 324, ASTE Show, Chicago, March 19-23.**

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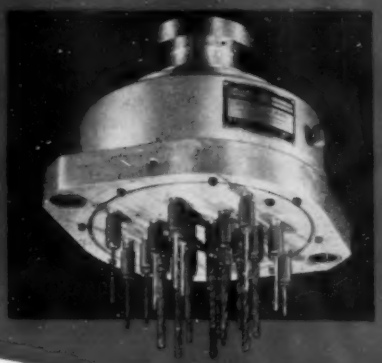
FOR DRILLING, REAMING AND TAPPING . . . . . .



*Any hole pattern — on any center up to 1⅛" dia.*

## Zagar's Broad-Scope Engineering SOLVES ANY HOLE PROBLEM

Zagar meets every drilling problem with the most effective, low cost equipment: gearless drill heads, standard drilling machines, special drilling machines, and index, trunnion or pallet-type multi-station transfer machines. We can furnish the complete tooling if you desire. Perhaps Zagar drill heads can be installed profitably on your own drill press. Send us a drawing of the part you are planning to drill. Or, let us study your present situation with a view to reducing your drilling cost.

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**Zagar**

*TOOLS FOR INDUSTRY and SPECIAL MACHINERY*

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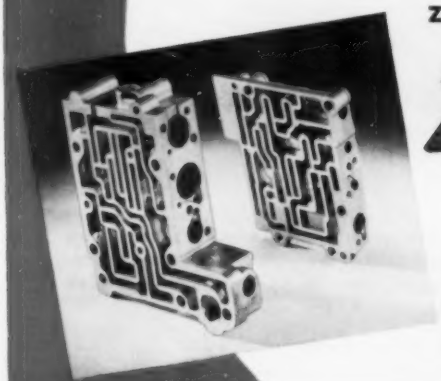
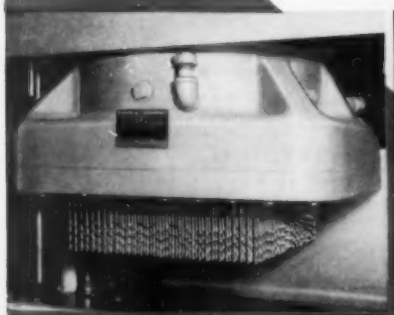
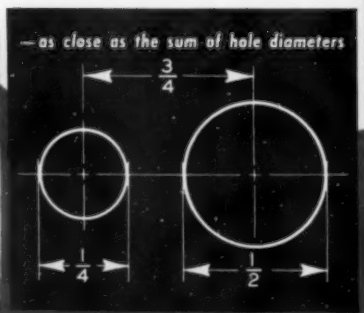
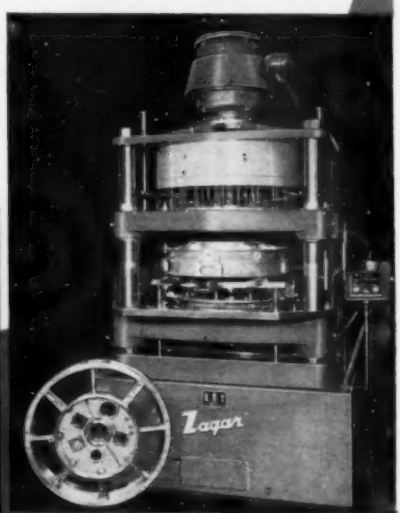


*Any machinable material — from all angles.*



*Up to 1000 holes can be drilled IN ONE PASS.*



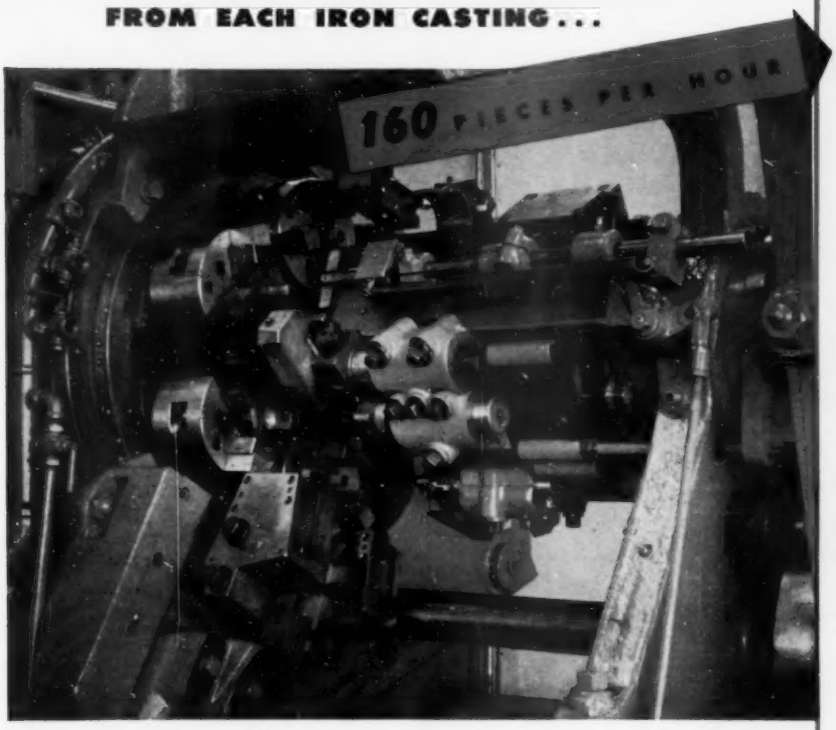

*4-post ram-type drilling machine for aircraft parts.*

**4th in a Series...**

**OF HIGH PRODUCTION CASE HISTORIES**

**ASK BAIRD ABOUT IT**

## "TURN-AROUND" JOB... PRODUCES 2 HYDRAULIC LIFT PISTONS FROM EACH IRON CASTING...



**FIRST PASS:**

Work is placed in chuck equipped to receive the unfinished casting. Outer end is then rough-and-finish turned on OD (allowing for grinding); ends are faced; spherical seat rough-and-finish turned; centering seat chamfered and turned, and shoulder diameter turned concentric with OD. Groove cut concentric with OD.

**SECOND PASS:**

Work is turned around after return to loading station and placed in adjacent chuck, unfinished end out, and passed through machine for the same operations. The parts are then separated.

**TOOLING:** This Baird 76H Chucking Machine is arranged for single indexing with alternate chucks for rough-and-finished ends of the work, two-station live-center attachment, adjustable tool holder for use in machining three different sizes of pistons, and with alternate cycle cut-off.

If your production could benefit by up-to-the-minute, cost-saving "automation" tooling like this . . . "Ask Baird About It."

Write Dept. TE

**THE BAIRD MACHINE COMPANY**

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*WHERE YOU WILL GET THE HELP OF SPECIALISTS ON THESE ESSENTIAL PRODUCTION PROBLEMS:*

AUTOMATIC MACHINE TOOLS • AUTOMATIC METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

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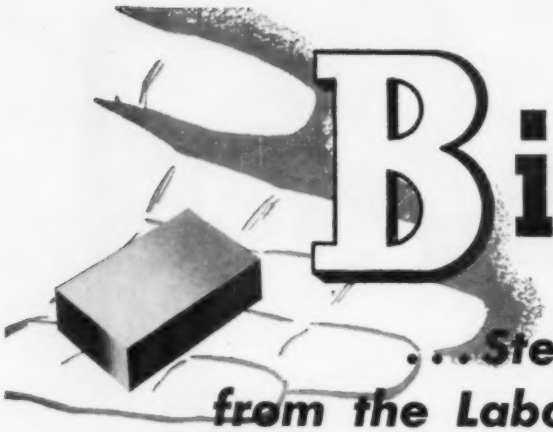

# Birthstone

## . . . Steel Cutting Carbide from the Laboratories of Ramet

**1930** — In this year the stage for automation was set by the development of tantalum-carbide in the laboratories of Ramet Corporation of America, now Vascoloy-Ramet Corporation.

Here was the first successful steel-cutting grade of carbide. Here was a cutting edge for which machine tools were yet to be developed. Here was the birthstone for today's mass production, for cutting speeds and tool life previously impossible.

**TODAY** — Vascoloy-Ramet research and development has speeded the progress of cemented carbide tools. Improved manufacturing, design, application and quality control plus new carbide grades, new tools and new toolholders offer the carbide user constantly growing opportunity for speeding production and lowering costs. Applications not feasible yesterday are in successful, profitable use today Ask your V-R man to help you apply carbides more fully.

**TOMORROW** — The carbide frontiers of today are being crossed one by one through continuous development and application engineering. The carbide industry has learned never to say "it can't be done". Your V-R man can help you develop carbide applications to reduce costs on jobs now being done with less efficient tooling. Talk it over with him.

*Write for V-R Carbide Catalog for complete information on V-R carbide products.*

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at the 1956 ASTE
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Get the
Cost-Cutting Edges
from the V-R Man!
*Call your local V-R distributor or representative.*

**Pioneers in Cemented Carbides • Tools Blanks • Toolholders • Inserts • Dies**

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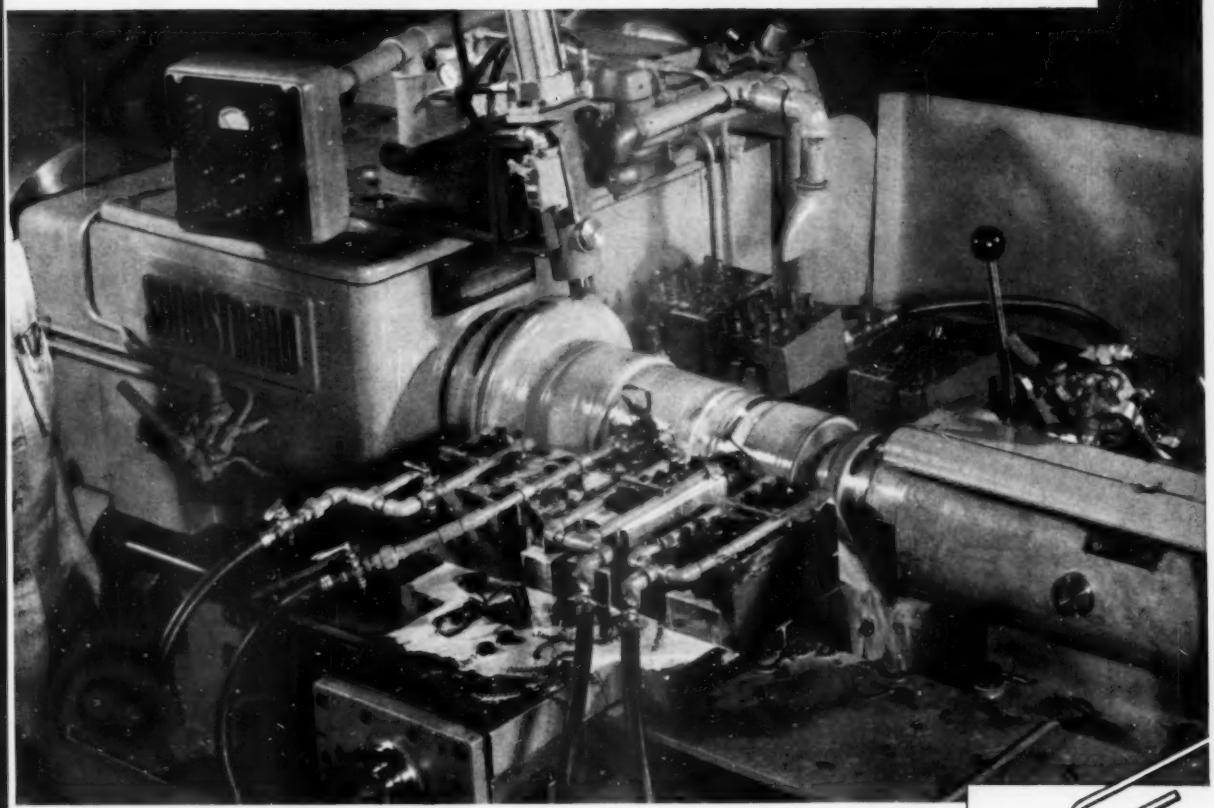
# of Automation



## How V-R Cutting Edges Can Cut Your Costs

### $800 Yearly Saving on One Machine . . .

A major electrical equipment manufacturer reports this impressive saving on turning steel shafts for electric motors since replacing previous carbide tools with V-R Carbide.

### 75% More Output Per Grind . . .

In boring the I.D. on a cast steel transmission housing, a leading automobile manufacturer reports 700 pieces per grind with V-R Carbide compared to 400 pieces with previous carbide.

### Output Increased Six Times . . .

Rough turning, semi-finishing and cutting off to length of Inconel X bolts was increased from 5 pieces per day to 30 at a well known aircraft plant when V-R Carbides replaced another type.

. . . and, **TANTUNG TOOLS,** made of V-R's *exclusive* cast alloy with high red-hardness, low friction coefficient and extra high strength. Get the facts about these tools that bridge the gap between high speed steel and cemented carbides. Ask for CATALOG.

**MANUFACTURERS OF—CARBIDES . . . TANTUNG . . . INVESTMENT CASTINGS . . . MINING TOOLS**

# Vascoloy-Ramet Corporation

**SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION**

**876 S. Market St., Waukegan, Illinois**



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-391

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*Check the Specs* ON THIS NEW BASE UNIT

*MORE PARTS PER HOUR
THE LIFELINE OF AUTOMATION

This all new base unit for PEECO vibratory equipment is fast establishing itself as a champion parts feeder. The very lifeline of automation is MORE PARTS per HOUR. The new PEECO not only delivers parts to the production line faster, but more important, delivers them sorted and oriented. The new specs will convince you. Send for your copy today.

*You can see them at Booth 1210.*
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*WE'LL BE WATCHING FOR YOU*

Peeco
PERRY EQUIPMENT & ENGINEERING CO.
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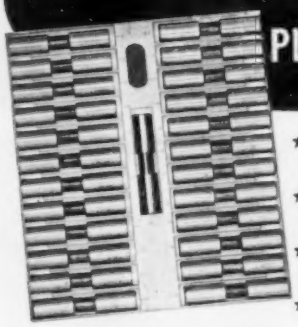
# CLOSER TOLERANCES with DELTRONIC TENTH PLUG GAUGES



★ Size variation by ten thousandths
★ Set of 25 costs approximately same as Go and No-Go gauge.
★ Available in increments of 1/64" from 1/8" to 1"
★ Hardness is Rockwell C62/C64

This new system of precision gauging provides one gauge of nominal size plus 12 gauges of increasingly larger sizes in .0001" increments and 12 gauges of decreasingly smaller sizes in increments of .0001". Each gauge is identified. It is the same size on both ends to double the life in usage.

*For further information write Dept. D12.*

DELTRONIC CORPORATION
1507 RIVERSIDE DRIVE • LOS ANGELES 31, CALIF.

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by reducing set-up time as much as 90%

With Jig Boring Accuracy

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ADVANCE CROSS-SLIDE ROTARY TABLE

*Proved by actual on-the-job performance

permits fast, precise positioning of work-piece from ONE SET-UP. No unclamping and reclamping on your standard vertical mill equipped with ADVANCE Cross-Slide Rotary Table. Only your milling machine's table movement limits the size radius you can cut.

*Ideal for tools, dies, jigs, fixtures, gauges, patterns, molds, cams, templates, models and experimental work. Write for specifications and literature today.*

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GRINDERS

SCREW DRIVERS

SCALING HAMMERS

***Try these lightweight . . . speedy***

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- Produced in the industry's most modern, air-conditioned plant to give you *top precision.*
- Gives you advanced features for *faster production, easier handling.*
- Backed by Rotor Tool's 25-year reputation for applying the *right tool for your job.*

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*See how they can cut your costs!*

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IMPACT WRENCHES

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CONE GRINDERS

GRINDERS

AIR

HIGH CYCLE

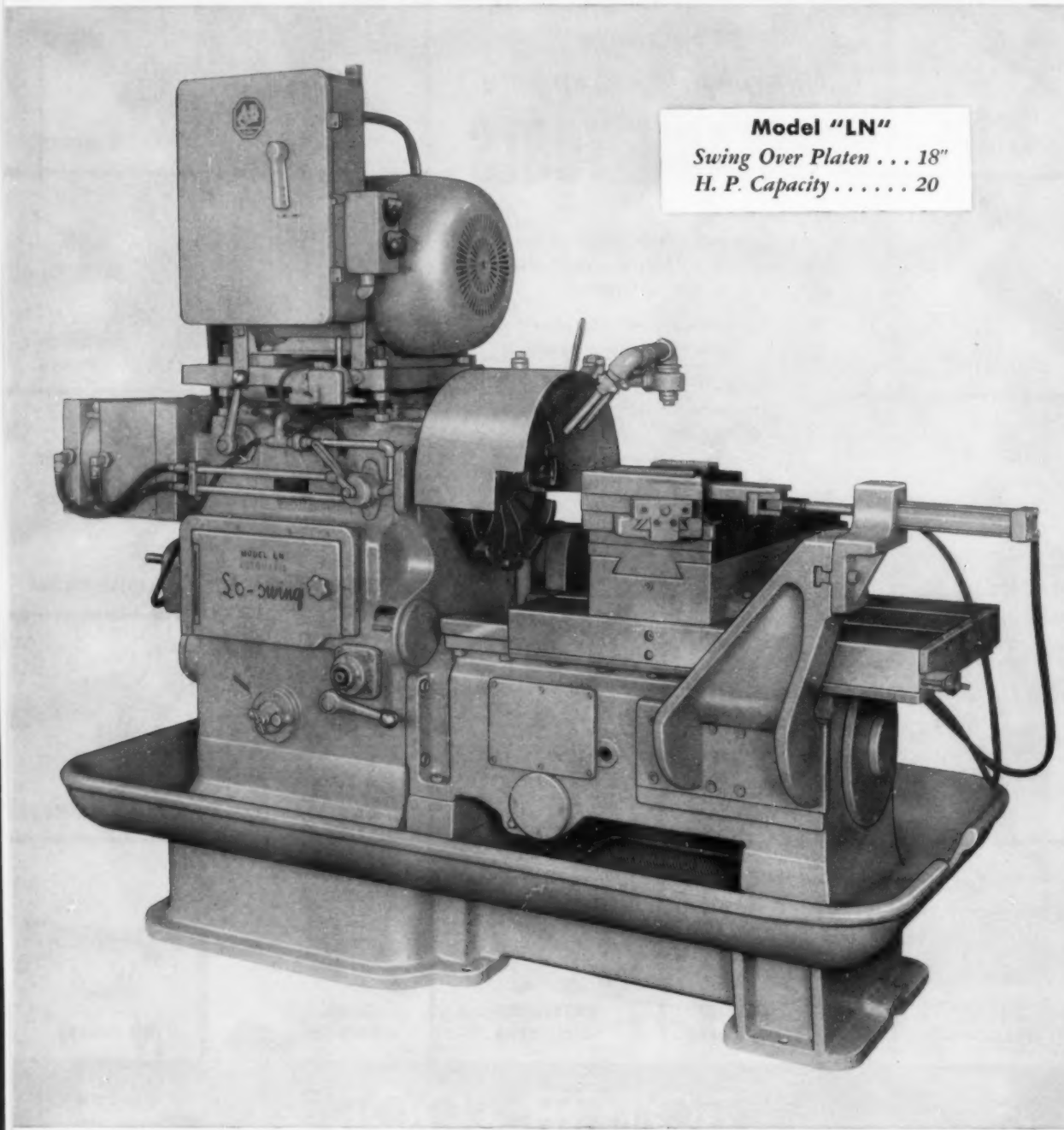
THE ROTOR TOOL CO.

CLEVELAND, OHIO

*UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS*

# MACHINE OF

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *So-swing* PEOPLE" SENECA FALLS, NEW YORK




## SENECA FALLS PLATEN-TYPE,

# THE MONTH

## NEW PLATEN-TYPE AUTOMATIC LATHES CUT BORING, FACING AND TURNING COSTS

The NEW Seneca Falls Platen-Type Automatic Lathes have been designed principally as chucking machines adaptable to a wide variety of work requiring large swing capacity, high spindle speeds, multiple tooling and fast cycling operation.

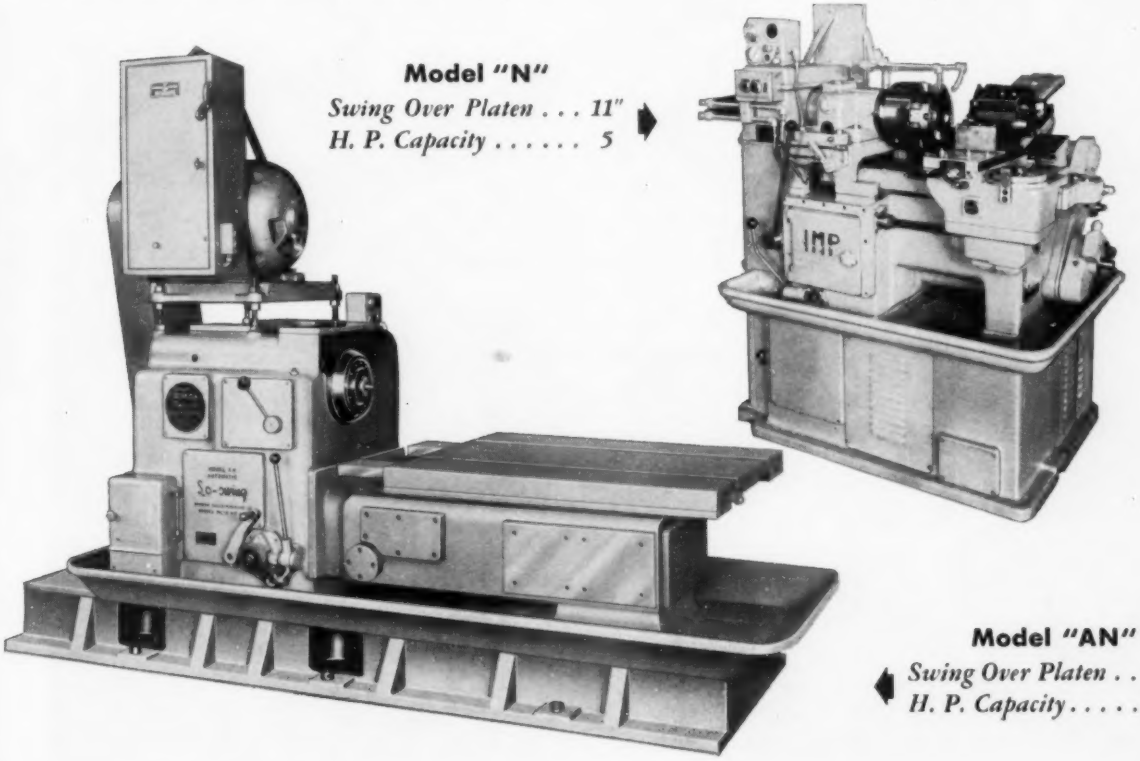
The platens have cam operated longitudinal and cross feeds and may be equipped with angular feeding slides and other special attachments suitable for customer's work.

All three types of machines may be equipped with Seneca Falls Automatic Loading and Transfer Equipment which provides means to extend automaticity to individual machines or through a series of successive, though dissimilar, operations to combine work loading, machining and work transfer into one single, automatically controlled phase of production flow.

Seneca Falls production-minded engineers are at your disposal to solve your chucking problems.

*Write for Bulletin 3*

**Model "N"**
*Swing Over Platen . . . 11"*
*H. P. Capacity . . . . . 5*



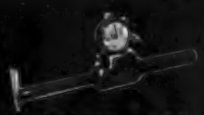
**Model "AN"**
*Swing Over Platen . . . 24"*
*H. P. Capacity . . . . . 40*

## CAM-OPERATED AUTOMATIC LATHES

# *30 stock answers to your gaging problems . . .

**SNAP GAGES**
Adjustable, for O.D., I.D., shoulders, grooves. 0" to 6" range with 2 models.

**GROOVE LOCATION GAGE**
Checks from face to top or bottom of groove, and deep holes or slots.



**GROOVE GAGES**
For "0" ring and snap ring grooves, 1/4" bore to 5". Adaptable for special applications.

**BORE GAGES**
For bores 1/4" to 12" dia. Two point setting with equalizers.

**DEEP HOLE GAGES**
For bores up to 20 feet in length. Prices on application.

**TEST INDICATORS**
Exclusive features with .001 or .0001 accuracy.

**COMPARASCOPE**
A precision instrument for checking surface finishes. West Coast Distributor for Hemco Gages

**THREAD AND GEAR WIRES**
Finest quality measuring wires.

**LIGHT WAVE EQUIPMENT**
Wide choice of capacities, with high level of visibility.

**GAGE BLOCKS**
Solid square in "A" accuracy. Rectangular in "A" or "B". Round micro-gages in "B".

**The *Reliant***
**" Product of the Month "**

**. . . A light precision gage with a range of 0" to 6 3/4"**

. . . Adaptable to checking assembly dimensions.

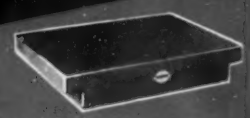
**Model B-1500**
Ask for catalog

. . . Replaces conventional flush-pin gaging.

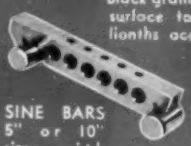
. . . Gages deep and narrow slot depths.

. . . Checks to either top or bottom of groove.

* There are many more, and some "special" ones, too.



**SURFACE PLATES**
Black granite, honed surface to 50 millionths accuracy.



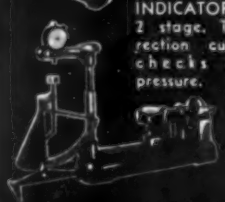
**SINE BARS**
5" or 10" sizes with projecting cylinders.

**PLUG AND RING GAGES**
Finest precision chrome plated gages.
West Coast Distributor for Hemco Gages

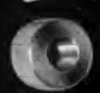
**ELECTRIC COMPARATORS**
English or metric graduations.
4 gaging ranges.

**TEST SETS**
Magnetic base or T-slot base models.

**INDICATOR TESTER**
2 stage. Takes correction curve and checks measuring pressure.



**MASTER SET RINGS**
Special - toleranced rings with a low price.



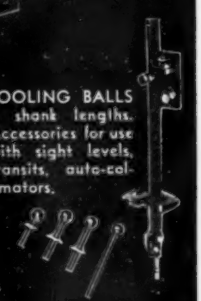
**BENCH CENTERS**
Inspect lengths, heights and diameters. Reversible centers. Accessories available.

**VERNIER CALIPERS**
Hardened tool steel with extended verniers. 6", 12", 20", 24" and 36" models.

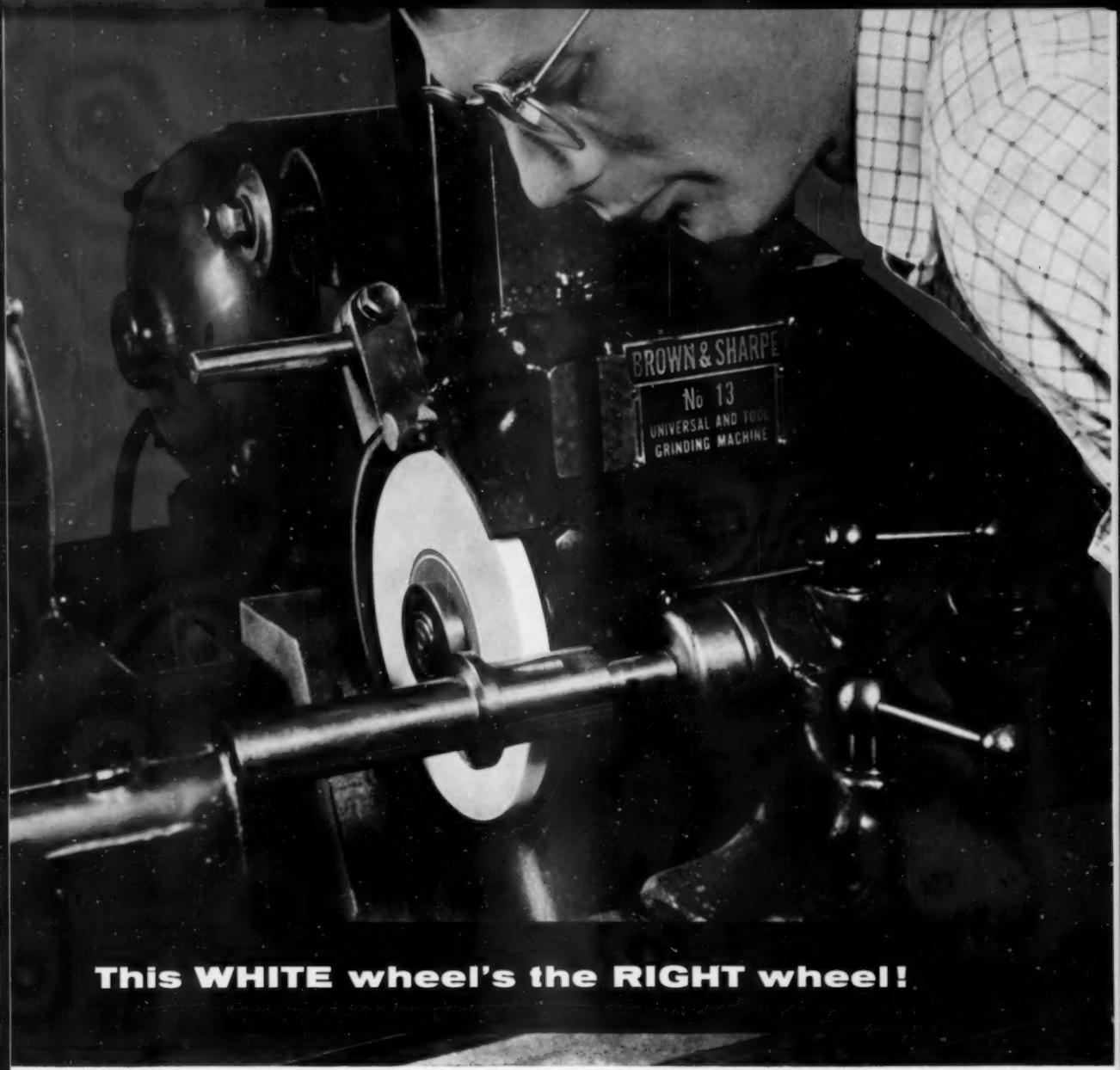
**BENCH COMPARATORS**
Several types available. 1 or 2 indicators.

**HEIGHT GAGES**
12", 18", 24" and 36" models. Extended verniers, carbide scribers, zero adjustment to surface.

**TOOLING BALLS**
4 shank lengths. Accessories for use with sight levels, transits, auto-collimators.



*Reliant* **RELIANT GAGE & SUPPLY CO.**
4947 FIRESTONE BOULEVARD
SOUTH GATE, CALIFORNIA
*Gages*




# This WHITE wheel's the RIGHT wheel!

PHOTOGRAPHED AT COLE CARBIDE INDUSTRIES, ROYAL OAK, MICH.

If you're after greater precision, production and economy in your tool room grinding, change to "V40" Bond Wheels by CARBORUNDUM. The sharp, white aluminum oxide grain cuts exceptionally free and cool, even on high speed tool steels. You can take heavier infeeds without burning the work...and still get a better finish. The stronger vitrified bond makes "V40" wheels last longer, without costly downtime for dressing midway through a job. "V40" wheels come in the *right* types, sizes and gradings for *every* tool room job. Call your CARBORUNDUM Distributor or salesman for a free demonstration in your shop. For your copy of Bulletin A-1310, giving actual "V40" case histories and recommended gradings, write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ont.

**Through application "know-how" and product quality**

# CARBORUNDUM

REGISTERED TRADE MARK

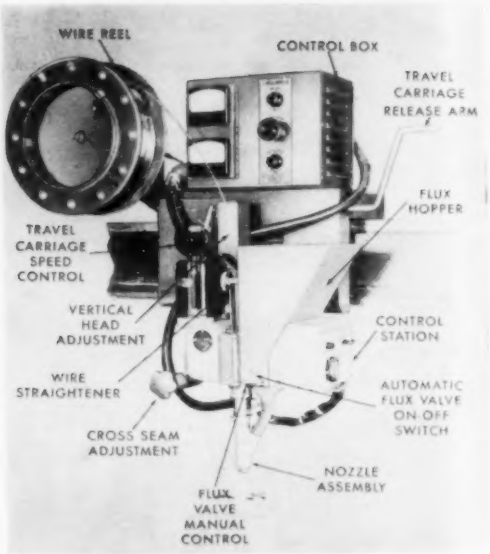
**continually puts more sense in your abrasive dollar**

When a line of automatic welders for DC and AC operation

Has the most sensitive controls for fast starting and uniform welds

Yet is easiest to adapt to any fixture

**WHY** buy anything but LINCOLNWELD for automatic welding




## Industry's most versatile automatic welder

# LINCOLNWELD

***LAF-3 FOR DC WELDING • LAF-4 FOR AC WELDING***
***LAF-5 FOR FIELD WELDING***

*gives you:*

- best starting... uniform welds
- cold starts or hot starts
- variable voltage, constant potential power
- slow-to-fast inching speed
- simple accurate positioning

**HOW TO SIMPLIFY AUTOMATIC TOOLING** with Lincolnweld is shown in Lincoln Bulletin SB-1355. Write

**THE LINCOLN ELECTRIC COMPANY**
Dept. 5008, Cleveland 17, Ohio

***LINCOLN...one dependable source for all your welding needs***
***welders—power sources—fluxes—electrodes***
***application engineering***

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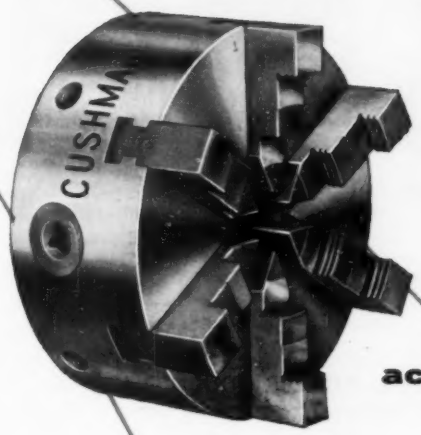
# CUSHMAN chucks

## give Chuck-ability

CHUCK-ABILITY — The ability to SPEED your work . . . ELIMINATE fatigue . . . IMPROVE your products . . . and REDUCE your costs . . . through design and selection of the right work-holding devices.

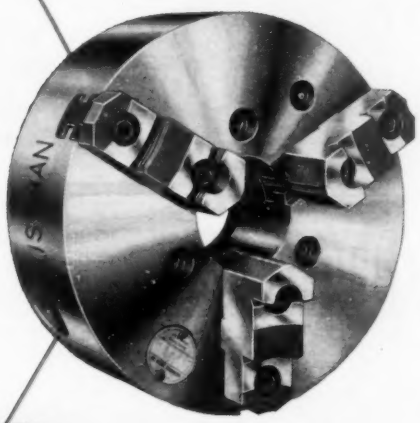



*see these new chucks at . . .*

**BOOTH 579 ASTE SHOW**

### accra-set chucks

- Simple, quick adjustment . . . repeats to .0005" T.I.R.
- Ideal for precision bar work.
- Rigid body with positive locking eliminates rotational slippage.
- Available with 3 or 6 jaws.




### manually operated compensating chucks

- Maximum compensation with precision performance.
- Permits holding irregularly shaped workpieces.
- Available for medium or heavy duty work.

### air operated compensating chucks

- Greater compensating action than ever before possible.
- The advantage of two chucks in one body . . . compensating action or regular self-centering operation.

**THE CUSHMAN CHUCK COMPANY** · Hartford 2, Connecticut

**CUSHMAN CHUCKS . . .**
a Product of American Quality, Labor and Materials.

a world standard for precision

CUSHMAN the CHUCKMAN CHUCKS Exclusively 1862

**SEE YOUR INDUSTRIAL DISTRIBUTOR**

manufacturers of:

Air Operated Chucks, Cylinders, and Accessory Equipment . . . The Cushman Power Wrench . . . Cushman Manually Operated Chucks and Face Plate Jaws.

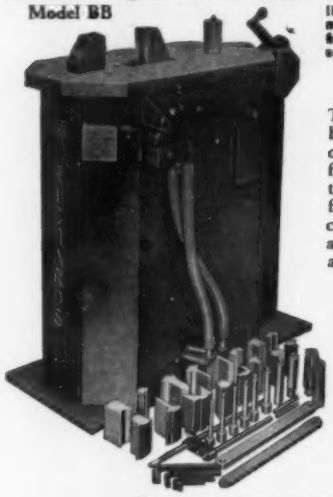
2CS56A

Multiform

## BIG BROTHER BENDER

**Produces Without Special Tooling—Saves Die Costs Saves on Expensive Presses**

Model BB



Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender using the standard tooling.

The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches—punching and blanking dies extra.

Will punch holes up to 1" and form material up to ¼" thick by 4" wide. We also build smaller hand or air operated models for forming up to ⅛"x1½" material. These machines are solving new forming problems in many plants and could be the answer to yours.

*Send for illustrated folder TE-5*

903 North Pitcher St.
Kalamazoo, Michigan

**J. A. RICHARDS CO.**

USE READER SERVICE CARD; INDICATE A-3-400-1

## Stops Losses FROM SPINDLE MISALIGNMENT

On tapping and reaming jobs, it is a simple matter to avoid spoilage losses caused by misalignment of the work with the spindle.

Change over from ordinary tool holders to the Ziegler Floating Tool Holder — the type of holder that automatically compensates for inaccuracies in alignment up to 1/16" on the diameter — and your troubles will be over.

Try it and see for yourself!

**PROMPT DELIVERY**

**W. M. ZIEGLER TOOL COMPANY**

13574 AUBURN DETROIT 23, MICH.

Ziegler ROLLER DRIVE **FLOATING HOLDER** for Taps and Reamers...

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## CONCENTRIC LIVE CENTERS

*the original, patented*

## spring loaded live centers

**AUTOMATIC THRUST ADJUSTMENT**
Spring loaded spindle maintains constant tail stock thrust.

**LONGER LIFE**
Needle bearing distributes bearing stress over greater surface, thus holding close tolerances for much longer time.

**FASTER SPEEDS**
Smaller turning radius gives much higher RPM rate than ordinary live centers.

**GREATER LOAD CAPACITY**

LESS OVERHANG MEANS MORE RIGIDITY . . MORE WORKING RANGE

**JAM PROOF**

*Write today for complete information*




Pat No. 2,520,473

**CONCENTRIC TOOL CORP.**, 2486 Huntington Dr. San Marino, Calif.

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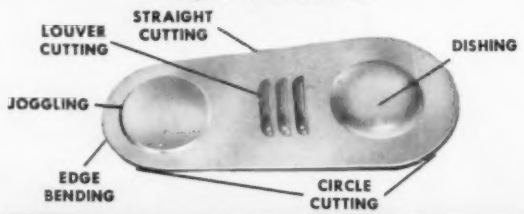
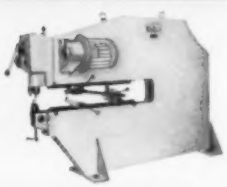
## PULLMAX METALWORKING IDEAS

*This safety guard for a chain drive made complete on a PULLMAX*




**Pullmax machines have the versatility to do all of the metalworking jobs in your Model Shop, Engineering or Maintenance Departments.**

One machine does straight shearing, inside or outside circle cutting, design cutting, inside square cutting, beading, joggling, slot cutting, louver cutting, dishing, edge bending and flanging. Seven sizes of machines cut up to 11½" in mild steel. Ask for a demonstration.



**Write for the Pullmax Catalog on Money-Saving Metalworking Ideas.**

**AMERICAN PULLMAX COMPANY INC.**

2451 North Sheffield Avenue • Chicago 41, Illinois

USE READER SERVICE CARD; INDICATE A-3-400-4

*all you've wanted in*

**PRODUCTION TYPE—SIZE CONTROL**

# HONING TOOLS

### DESIGN AND OPERATING SIMPLICITY

A new rigid shaft construction, without "universal joints" makes the Jes-Cal size control hone a solidly supported extension of the machine spindle. This construction eliminates the need for actuating bushings and bushing bracket, permits generation of bore accuracy and correction of error within limits of only a few ten-thousandths of an inch, closer parallelism of bore axes as in cylinder blocks, and eliminates "swipes" as the tool leaves the bore. Simpler tool design with relatively fewer, precision built parts minimizes chatter, permitting faster, cooler, more positive cutting action with lower cutting pressure.

The Jes-Cal size control gage is positioned around the honing tool spindle. It has carbide tipped contact points for long, hard service of many months without losing size, and is the most positive, dependable and economical method of size control available. This gage stops honing action immediately and automatically, through a simple limit switch, when the gage enters the bore.

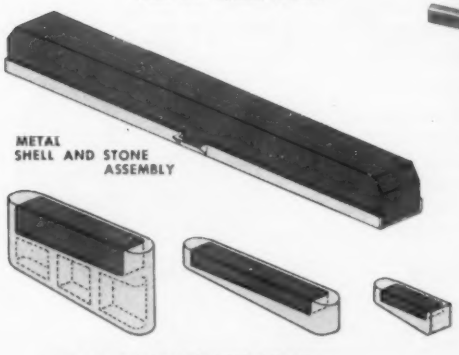
### DEPENDABLE MACHINING ACTION

The Jes-Cal rigid shaft construction delivers a maximum of spindle power application, permits extremely fast and efficient stock removal, and makes possible corrections of large amounts of error such as out-of-roundness, snakiness, bell mouth and taper. Bore accuracy may be held easily within the range of 0.0001 to 0.0005-inch limits in most applications.

### LOWER OPERATING COSTS

The above features with their many refinements permit Jes-Cal size control honing tools to record much lower operating costs in production as compared with previous experience.

*Write for Bulletin JC-101*

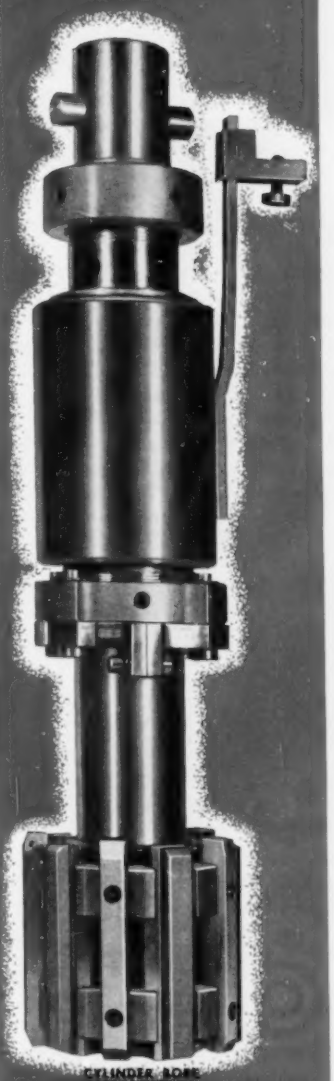



JES-CAL PLASTIC MOUNTED STONES
WITH LEADING EDGE AND SIDE OPEN

SMALL DIAMETER
SIZE CONTROL
HONING TOOL

CON ROD
SIZE CONTROL
HONING TOOL

JES-CAL
SIZE CONTROL
HONE



CYLINDER BORE
SIZE CONTROL
HONING TOOL

**JES-CAL COMPANY**

13500 EAST NINE MILE ROAD, EAST DETROIT, MICHIGAN

# what are diamond tools made of?

*integrity*

*experience*

*craftsmanship*

*value*

For thirty years "Koebelite" has been an outstanding name in industrial diamonds. The Koebel Company, one of the largest in the field, has pioneered a seemingly endless procession of diamond tool advancements that have greatly influenced diamond tool practice throughout the world.

"CEMENTED DIAMOND PARTICLES" introduces a totally new concept in diamond tool engineering and design.

In almost every industry, wherever diamond tools are used, there exists the possibility that CDP can do the job better, more economically. This material is particularly adaptable to existing and newly planned automatic production machinery. Details supplied on request.

C D P

Visit us at Booth No. 209 at ASTE Show

*The material with a million points*

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**DIAMOND TOOL CO.**

First to give industry the benefits of Diamonds set in Powdered Metal.

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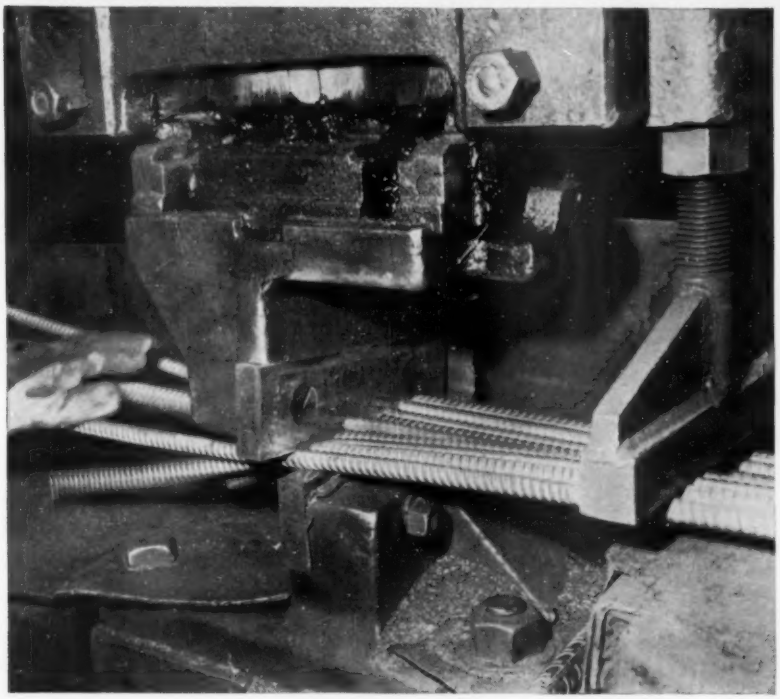
# Tool Steel Topics

BETHLEHEM STEEL

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

## Shear Blades Last Twice As Long When Fabricator Changes to Bearcat

For many months a Midwestern fabricator had been using shear blades made of an alloy tool steel. The blades were used in cutting steel reinforcing bars and joists. Production was fairly good, too, as each blade sheared approximately 400 tons of material per side before being redressed.

Then he decided to try, in the same operation, a blade made of Bethlehem Bearcat tool steel. The blade, hardened to Rockwell C-59, was put to work shearing both ¼ in.-x-4 in. plate steel, and reinforcing bars ranging in diameter from ⅜ in. to 1¼ in. The advantage of longer wear and greater economy was soon apparent, for the new blade handled more than 830 tons of material per side —more than twice the tonnage which had been sheared by the former blade.

Bearcat is a tough, general-purpose air-hardening tool steel. It has superior resistance to wear, and is also exceptionally resistant to shock. Bearcat has an air-hardening characteristic, which minimizes quenching hazards and also provides good resistance to distortion in heat-treatment.

In addition to shear blades, Bearcat tool steel can be used economically for such varied items as chisels, punches, gripper dies, rivet sets, hot headers, master hobs and die-casting die inserts.

Why not put in an order for a trial piece of Bearcat today, while you have it in mind? You can't lose by giving it a workout. All you need do is get in touch with your Bethlehem tool steel distributor. He's as near as your telephone. Or order direct from our mill depot.

## BETHLEHEM TOOL STEEL ENGINEER SAYS:

### *Blind Holes Are Dangerous*

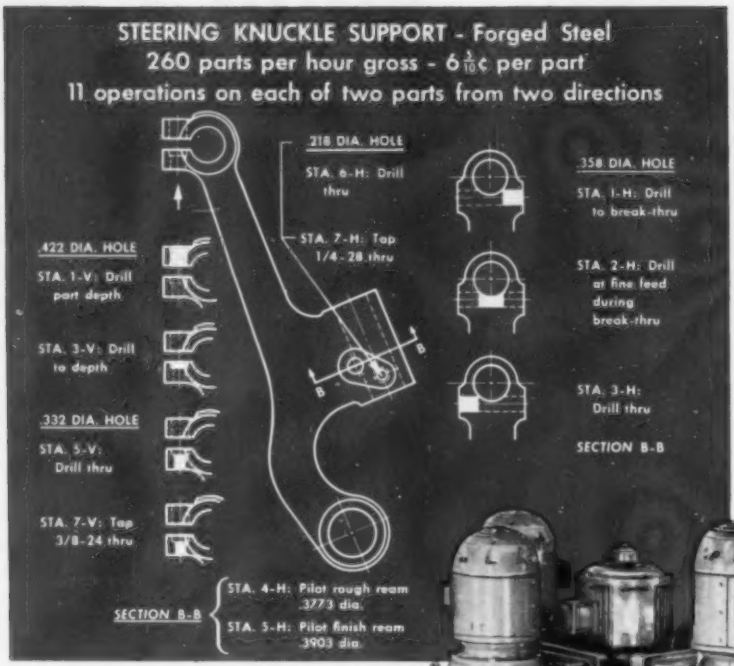
Without proper care, blind holes can be troublesome in the heat-treatment of tools. Typical of blind holes which usually get little attention are holes for studs or dowel pins. The exposure of blind holes to liquid-quenching produces extremely high internal stresses, with the possibility of cracking the tool during heat-treatment, or in service.

If it is not required that blind holes be hard internally, trouble can be avoided by packing the holes, prior to quenching, with clay, asbestos rope, steel wool, or a steel plug. Blind holes are particularly objectionable if they are required to be uniformly hard on the inside surface. This requirement can be met consistently only by using air-hardening steels.

"Teamwork" is the title of a 16-mm color film, with sound, recently released by Bethlehem. The film describes the manufacture of Bethlehem tool steel, and explains its quality-control and heat-treatment. Typical applications of carbon, oil- and air-hardening, shock-resisting, hot-work, and high-speed grades are included.

Prints of this 30-minute film are available for showing to distributors, heat-treaters, die-makers, machinists and machine-tool manufacturers, as well as to technical societies and engineering students. If you would like to see the picture, just write to Publications Department, Bethlehem Steel Company, Bethlehem, Pa. It would be well to select a showing date as far in advance as possible.

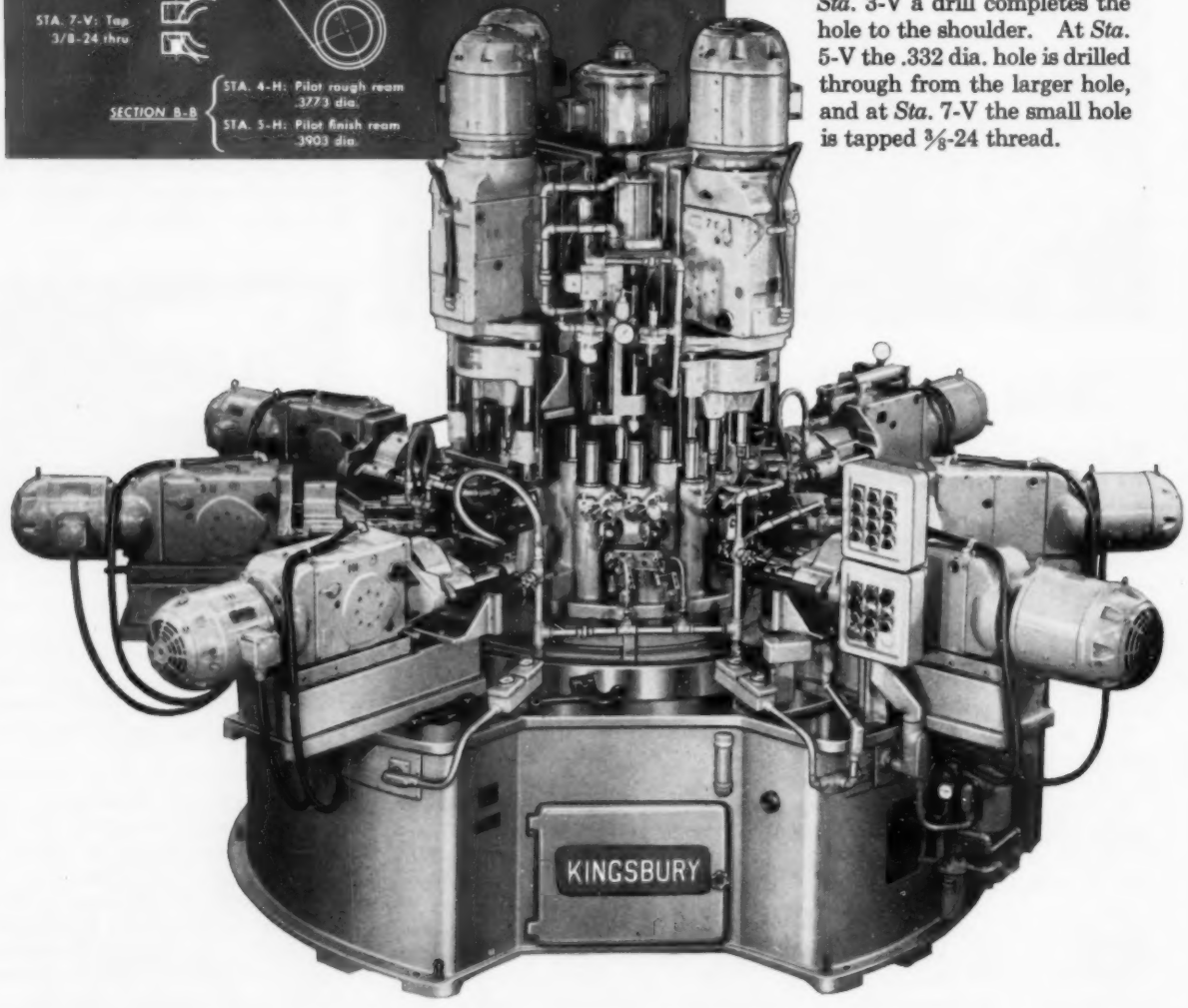
# Where slow-down speeds-up "Operations Kingsbury"


STEERING KNUCKLE SUPPORT - Forged Steel
260 parts per hour gross - 6 1/10¢ per part
11 operations on each of two parts from two directions
.218 DIA. HOLE
STA. 6-H: Drill thru
STA. 7-H: Tap 1/4-28 thru
.358 DIA. HOLE
STA. 1-H: Drill to break-thru
STA. 2-H: Drill at fine feed during break-thru
STA. 3-H: Drill thru
SECTION B-B
.422 DIA. HOLE
STA. 1-V: Drill part depth
STA. 3-V: Drill to depth
.332 DIA. HOLE
STA. 5-V: Drill thru
STA. 7-V: Tap 3/8-24 thru
SECTION B-B
STA. 4-H: Pilot rough ream .3773 dia.
STA. 5-H: Pilot finish ream .3903 dia.

Drill three holes, ream one, tap one . . . This *is* a simple job — for a Kingsbury, but the part must be worked on by 11 units at seven working stations to insure uniform accuracy and production.

In order to produce 260 pieces per hour gross, each work-holding fixture holds two parts, and each unit has an auxiliary head and works on a hole in each part.

The blueprint at the left tells the story. Notice the .422 dia. hole in the pinch-bolt bearing. This section required four operations from the *vertical* position: At *Sta.* 1-V the .422 hole is drilled through to the milled slot. At *Sta.* 3-V a drill completes the hole to the shoulder. At *Sta.* 5-V the .332 dia. hole is drilled through from the larger hole, and at *Sta.* 7-V the small hole is tapped ⅜-24 thread.



# for greater accuracy and higher production . . .

Now look at Section B-B, the .358 dia. *horizontal* hole. It has a break-through with the axis hole, and must be accurate. This work is accomplished at five stations. *Sta.* 1-H drills to the break-through at normal feed. *Sta.* 2-H drills *at fine feed* during the break-through. *Sta.* 3-H completes the drilling at normal feed. At *Stas.* 4-H and 5-H, pilot reamers rough- and finish-ream the hole to exact specifications.

The .218 dia. hole involves simple drill-thru and tap operations, at *Stas.* 6-H and 7-H.

Each Kingsbury machine is designed and built to achieve three prime objectives: 1) *accurate* interchangeable parts as specified, produced at the 2) highest practicable production rate, and 3) at a cost per part which will make the machine a wise investment. And each Kingsbury machine proves itself in a trial run before it is delivered.

## Combined operations promote savings in equipment, and lower costs per part

When we designed the Kingsbury machine shown below, we estimated its production at 250 parts per hour gross. We were low: it's producing 308 parts per hour gross, at 2 4/10c per part.

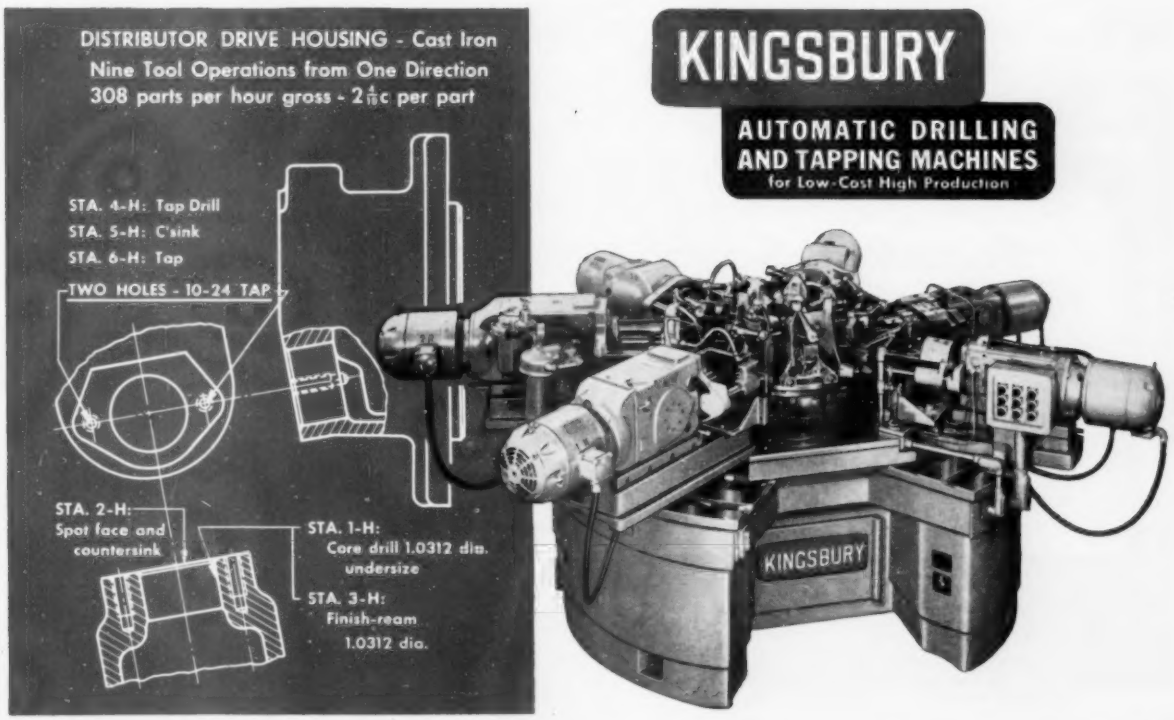
The machine has an 80-inch base on which are mounted six drilling and tapping units. A 24-inch index table with seven work-holding fixtures indexes through seven stations — one for loading and unloading.

All work is performed horizontally. The 1.0312 dia. hole is core-drilled undersize at *Sta.* 1-H, and finish-reamed 1.0312 at *Sta.* 3-H. *Sta.* 2-H spot-faces the joint face and forms countersink.

At *Stas.* 4, 5, 6, the Kingsbury units are equipped with auxiliary heads and drill, countersink and tap (10-24) the two small holes.

This Kingsbury is a good example of the savings in equipment and time which result when operations can be combined without risking uniformity. And, as is true with all Kingsburys, one of the big "secrets" of its success is the design of the work-holding fixtures. A part must be positioned in a matter of seconds, and held securely at each station, if the work is to be accurate. Therefore, the work-holding fixture is the very *heart* of a Kingsbury, and it's built with loving care! Perhaps that's one reason why Kingsburys perform so well!

Kingsbury Machine Tool Corp.
115 Laurel Street
Keene, N. H.

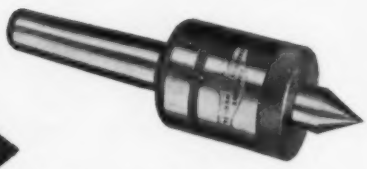

DISTRIBUTOR DRIVE HOUSING - Cast Iron
Nine Tool Operations from One Direction
308 parts per hour gross - 2 4/10c per part
STA. 4-H: Tap Drill
STA. 5-H: C'sink
STA. 6-H: Tap
TWO HOLES - 10-24 TAP
STA. 2-H: Spot face and countersink
STA. 1-H: Core drill 1.0312 dia. undersize
STA. 3-H: Finish-ream 1.0312 dia.
KINGSBURY
AUTOMATIC DRILLING AND TAPPING MACHINES
for Low-Cost High Production
KINGSBURY

# Glenzer

Utility Tools

**UTILITY SLEEVES**

Use lower-cost, straight shank small tools with these Removable Taper Shank Sleeves. Data Folder 1-A.



**LIVE CENTERS**

Cushioning reduces tool breakage —Timken Roller bearings give accuracy, long life. Data Folder 1-D.

**FLOATING TOOL HOLDERS**

Save set-up time, assure perfect work AND correct misalignment up to 1/32" radius. Data Folder 1-J.

*Specialized Service*
for
36 YEARS

Time-saving, money-saving Glenzer tools are specified standard by manufacturers throughout the country.

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1552 E. NINE MILE ROAD, DETROIT 20, MICH.

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COLLINS
MICROFLAT®
BLACK GRANITE

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- STRAIGHT EDGES
- LAYOUT PLATES
- PARALLELS
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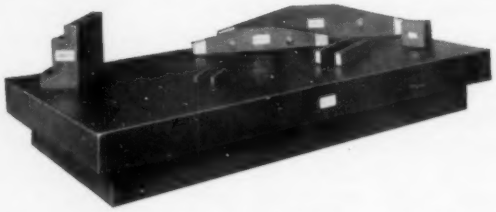

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Designed by Collins MICROFLAT Company and made from the highest quality Black Granite, these precision granite Plates and Accessories offer the user unfailing accuracy and service at a minimum of cost.

*Non-Warping ★ Non-Deflecting ★ Non-Rusting*

Write for bulletins describing these products in detail.

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**Accuracy 001" - No Distortion**
**No Slipping - Everlasting**

**K. O. LEE CO.**
ABERDEEN, SOUTH DAKOTA

*If it's made by* Lee *it's a* "Knock-Out"

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USE
GATCO ROTARY BUSHINGS
WITH
Your Boring Bars
FOR
*ACCURACY*
and
*SAVE WEAR*

Eliminates expensive tool construction – Reduces tool wear – Prevents seizure and pilot breakage – Especially adapted where precision is required.

ORIGINATORS OF THE ROTARY BUSHING
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FOR DRILLING, CORE DRILLING, ROUGH AND FINISHED BORING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work—or both.

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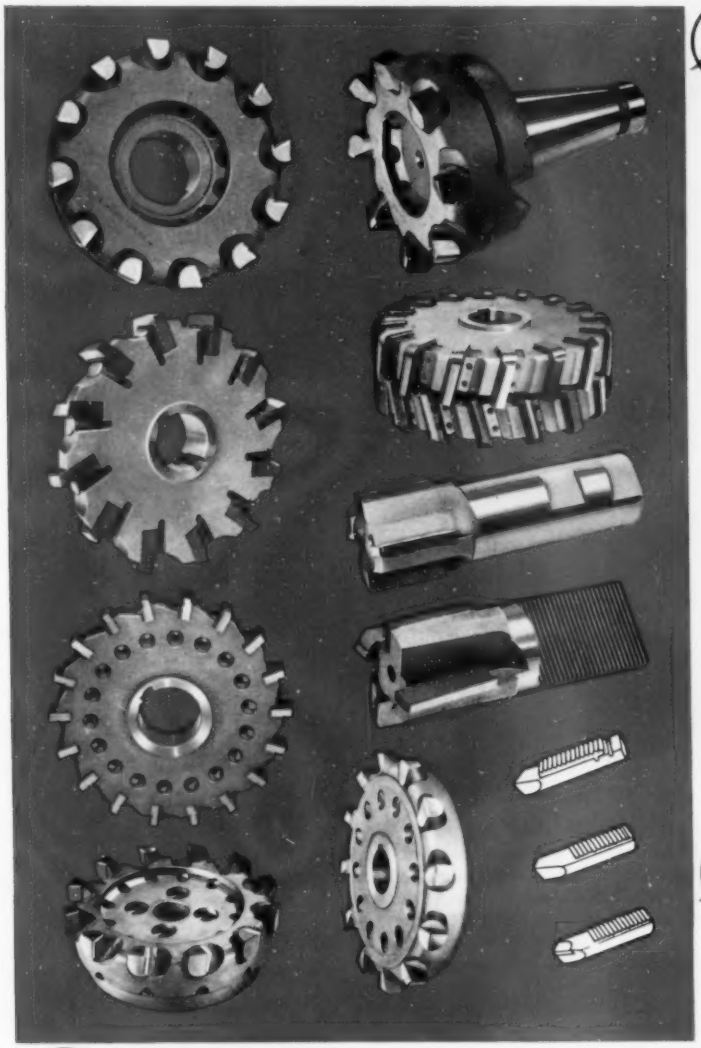
# You can cut costs with LOVEJOY milling cutters and accessories



## MILLING CUTTERS

The modern Lovejoy line of inserted-tooth milling cutters includes standard face, side, end, slotting and boring mills. They feature: husky, forged steel housings; the exclusive Lovejoy "positive-locking" blade assembly; dozens of models and hundreds of sizes to meet every requirement.

Lovejoy blades — H.S.S., carbide and cast alloy — are interchangeable over a wide range of housing sizes. In fact, Lovejoy blades for Type "A" face milling cutters will fit any standard Lovejoy Type "A" cutter of 4½" to 24" diameter ever built! All Lovejoy blades are carried in stock, ready for prompt shipment.

P.S. Are you up-to-date on Lovejoy's new set-screw type end mills and our new Type "Z" slotting cutters which provide maximum axial and radial adjustment?

Special cutters are a Lovejoy specialty.

**SEE THEM AT THE SHOW!**
**BOOTH 184**
**A.S.T.E. SHOW**

## MILLING ACCESSORIES

Lovejoy also makes a complete line of boring tools, arbors, flywheels, and the new Lovejoy Milling Cutter Assembly Gage.

**CATALOGS** — Lovejoy's new catalogs contain helpful, complete information. This literature is *free* — just mail the coupon today.

**LOVEJOY**
**TOOL COMPANY, INC.**
SPRINGFIELD, VERMONT, U. S. A.

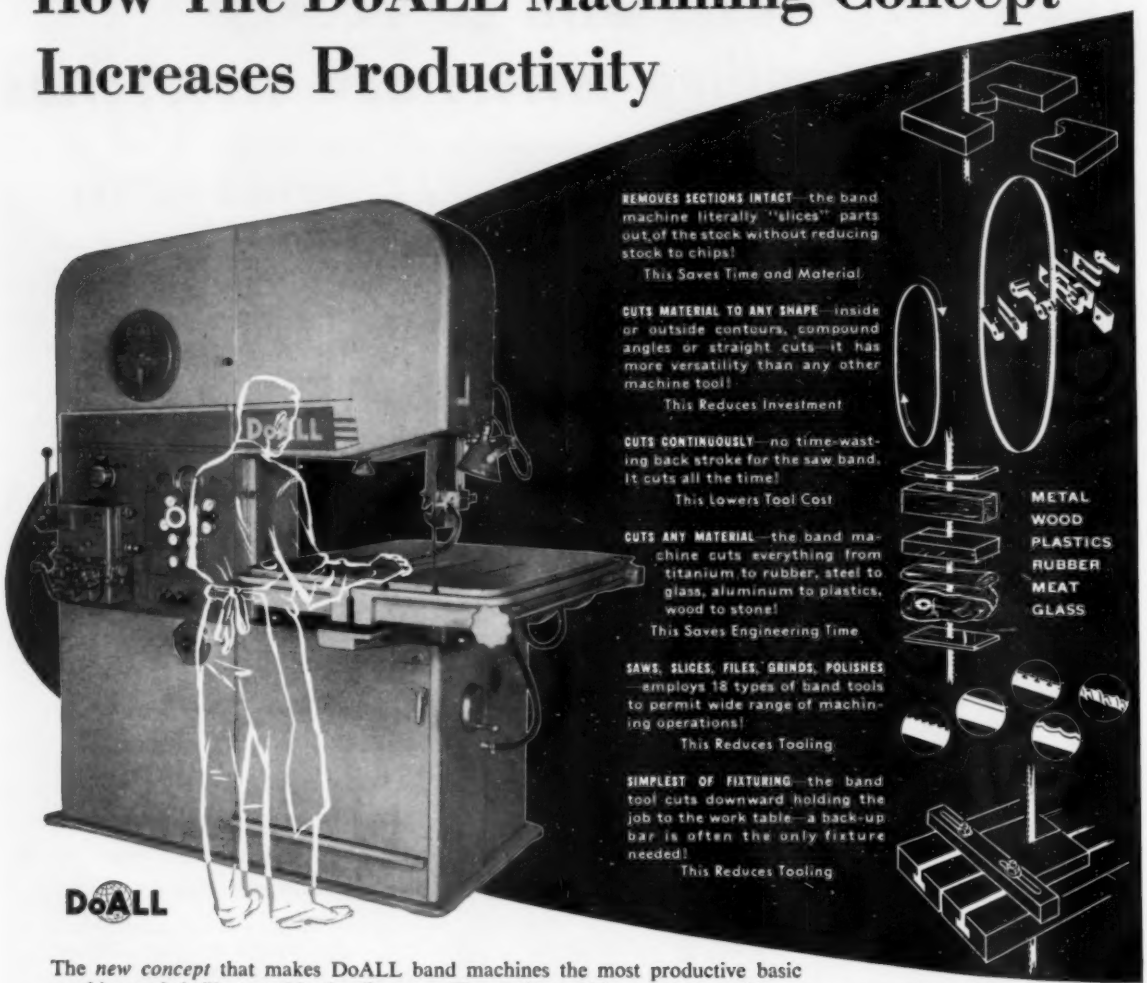
Lovejoy Tool Company, Inc.
131 Main Street, Springfield, Vermont

Gentlemen: Please send me the following:

_____ Face Mill Catalog, No. 31
_____ Side Mill Catalog, No. 32
_____ Type "S" Bulletin
_____ Arbor Catalog, No. 33
_____ Assembly Gage Bulletin
_____ "Speed and Feed" Calculator

NAME_____
TITLE_____
FIRM_____
STREET_____
CITY_____ ZONE_____ STATE_____

# How The DoALL Machining Concept Increases Productivity


DoALL
REMOVES SECTIONS INTACT—the band machine literally "slices" parts out of the stock without reducing stock to chips!
This Saves Time and Material
CUTS MATERIAL TO ANY SHAPE—inside or outside contours, compound angles or straight cuts—it has more versatility than any other machine tool!
This Reduces Investment
CUTS CONTINUOUSLY—no time-wasting back stroke for the saw band. It cuts all the time!
This Lowers Tool Cost
CUTS ANY MATERIAL—the band machine cuts everything from titanium to rubber, steel to glass, aluminum to plastics, wood to stone!
This Saves Engineering Time
SAWS, SLICES, FILES, GRINDS, POLISHES—employs 18 types of band tools to permit wide range of machining operations!
This Reduces Tooling
SIMPLEST OF FIXTURING—the band tool cuts downward holding the job to the work table—a back-up bar is often the only fixture needed!
This Reduces Tooling
METAL
WOOD
PLASTICS
RUBBER
MEAT
GLASS
DoALL

The *new concept* that makes DoALL band machines the most productive basic machine tools is illustrated in the diagrams. The cutting tool is a narrow steel band with hundreds of tool points—suspended between widely spaced tool holders. Hence the scope of its cutting action is not restricted. It is the world's fastest method of machining from solid steel. Everyday machining operations like slotting, notching, trimming, angular contour cutting, etc., as well as making special parts, can be routed to the DoALL Band Machine to gain enormous savings over former machining methods.

In addition, there is little or no waste of material or consumption of engineering time for fixturing and tooling with special machines.

And now this profitable machining method has a spectacular new cutting tool in the DoALL Demon *High-Speed Steel* Saw Band. There is no machining rival for its performance on DoALL Contour-matics. Cutting rates are up to ten times faster with up to thirty times longer cutting life.

We sincerely urge you to get the facts by calling your local DoALL Store. They will arrange a personal inspection demonstration of this machining concept in your plant. No obligation of course . . . it is our privilege to serve your machining needs.

**See New Films—**
revealing this new concept for cost reduction in machining. "Production Band Machining" 30 minutes. "Production Tooling" 10 minutes.

**Free-Educational Poster**

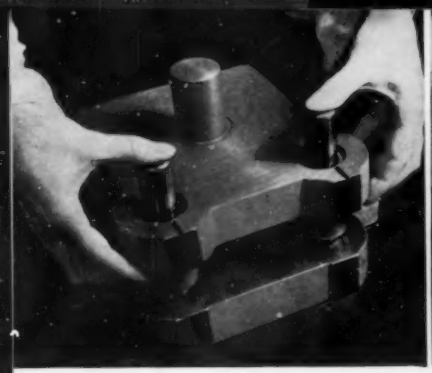
*Fundamentals of Economics in this age of machines and power are described in this Educational Wall Poster. Write for free copy.*

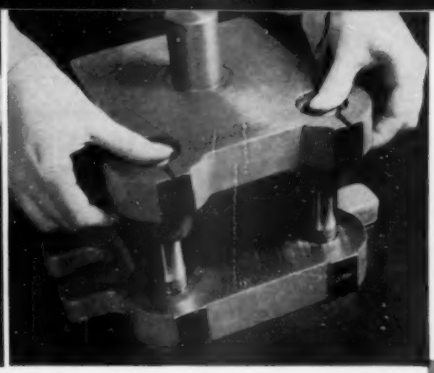
**See DoALL at the A.S.T.E. Show**
**Booth No. 1520. . . March 19-23**
**International Amphitheater, Chicago**

**THE DoALL COMPANY** Des Plaines, Illinois,
*Makers of Band Machines and Blades . . . they go together*

Demon and Contour-matic are registered trade marks of The DoALL Company.

Friendly DoALL Stores . . . (in 38 cities) offering personalized service . . . complete stock . . local delivery. B-26





**Here's a real test for quality**...if you can make the punch holder glide up the pins just by squeezing—and hold its position without sinking back—it shows that the fit between pins and bushings is well-nigh perfect. The "finger-tip" action is typical of all DIECO die sets small enough to squeeze this way...and the larger ones are just as perfectly fitted.

# What does "quality" in a die set mean to you?

If it means a perfect fit between pins and bushings...shoes that are absolutely parallel and stay parallel under load...*all* parts finished to precise tolerances with such unfailing regularity that there is never any variation in accuracy and serviceability among different die sets from the same source...then it stands to reason you must already be a user of DIECO die sets.

- Hardened steel pins superfinished and individually gaged to 0.0002" tolerance.
- High-tensile steel shoes, stress relieved and precision machined.
- Choice of bronze-plated bushings on hardened steel backing or hardened steel bushings—all with grease fittings. Precision ground and micro-honed to less than a "tenth" tolerance; can be arranged for pressure lubrication.
- Welded or screw shanks; any length guide pin.
- 1728 combinations in steel or semi-steel; interchangeable parts speed delivery.

## E. W. BLISS COMPANY

BLISS SINCE 1857

DIECO

**DIE SUPPLY DIVISION**

1400 Brookpark Road,
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*Industry's most complete line of die sets and die makers supplies*

**DIE SETS • GUIDE PINS • BUSHINGS • SPRINGS**
**SOCKET HEAD SCREWS • 5001 ITEMS**

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*Combination Machine set up for Internal Operation*

**PARKER-MAJESTIC** *presents the well known Internal and External Grinder shown here as a combination unit.*

- One spindle mounting bracket performs both operations.
- Quick changeover—Loosen only four nuts and swivel bracket 180° to bring spindle into operating position.
- 12" swing over table.
- Horsepower rating maintained in new totally enclosed motor design; drive pulleys mounted on either end of motor.
- Internal spindle driven by flat belt in conjunction with spring loaded idler assembly of new design.
- External spindle driven by timing belt requiring little belt tension.
- Operator protected by well designed guards.

*Combination Machine set up for External Operation*

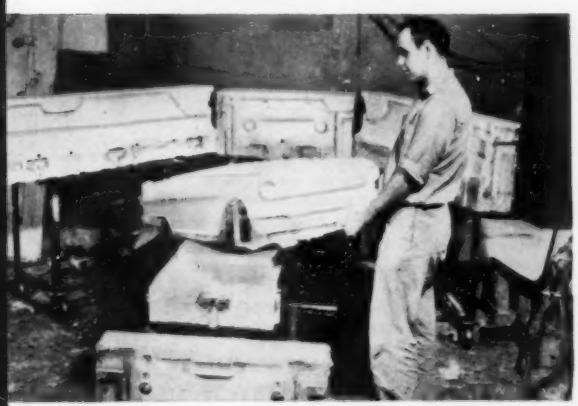
**PARKER-MAJESTIC, INC.**

**147 Joseph Campau • Detroit 7, Michigan**

# Small-scale sample shows big possibilities in plastic tools

**REINFORCED PLASTIC BODY** on the "Junior Star Chief" was produced from Rezolin "Toolplastik" compounds, based on BAKELITE Brand Epoxy Resins. The child-sized scaled-down replica of the 1956 Pontiac convertible is used for dealer promotions.

**Visit Bakelite Company's Exhibit, Booth #397, at A.S.T.E. Show, Chicago, March 19-23.**



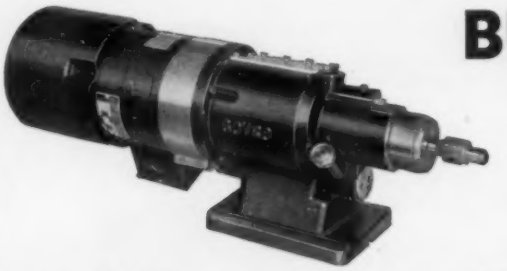
**FIVE MOLD SECTIONS,** shown here with cast body shell, will be clamped together to form complete body mold. These sections and the master model from which they are cast are made of compounds of BAKELITE Epoxy Resins. Dimensional stability of these materials prevents changes in size and shape. Their ability to harden at room temperature without shrinking speeds reduplication. "Toolplastik" compounds used are based on BAKELITE Epoxy Resins and are produced by **Rezolin, Inc.,** Los Angeles 45, Calif.

Where model changes are fast and frequent, metal and plastic products alike can benefit from the advantages of plastic tooling. Liquid compounds based on BAKELITE Brand Epoxy Resins can be cast into shape without pressure, cured at room temperature. Their minimum shrinkage means minimum finishing Dimensional stability is outstanding; flexural, impact, and compressive strengths, excellent. Light weight makes plastic tools easy to handle. Examples: jigs, spotting racks, and Keller models made from glass cloth—Rezolin "Toolplastik" compounds.

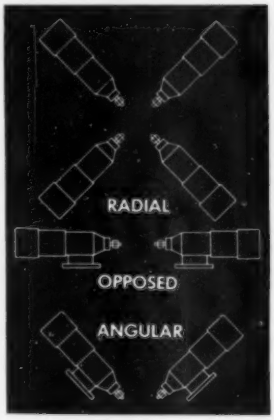
***For metal-working...***

BAKELITE
EPOXY RESINS

**BAKELITE COMPANY,** *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N.Y.
The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC



# BUILD YOUR OWN
## AUTOMATIC DRILLING OR TAPPING MACHINE




With Govro-Nelson Automatic Drilling and Tapping Units, together with the bases and electrical controls which we can supply, you can build yourself an automatic drilling or tapping machine at substantially lower cost than a special machine.
Any number of units may be employed. Examples of the various ways in which they may be arranged are shown at the right.

### DRILLING UNITS
The Drilling Units are made in several sizes with spindle speeds from 1100 to 3450 RPM. Drill Units have full Hydraulic Control with external adjustment for the rapid approach, the rate of feed and the length of stroke. Suitable for drills up to 3/8", depending on material.

### TAPPING UNITS
The Tapping Units are available in two sizes with 550 and 725 RPM spindle speed. Features include no clutch and no lead screw and automatic adjustment for various leads. Suitable for tapping 0-80 to 3/8-16, depending on material.

**Write for Literature**

*AT THE ASTE SHOW*
**Booth No. 1226**

*Automatic* **DRILLING UNIT**

**GOVRO-NELSON CO.**
*Machinists of Precision Parts for 33 Years*
**1933 Antoinette** **Detroit 8, Mich.**

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-412-1

# VAILL
TUBE END-FORMING MACHINES
shape and form tube ends
fast... accurate... at less cost




**FREE**—New Bulletin T-1 shows, describes VAILL tube end forming machine VERSATILITY for . . .

Beading • Flaring • Flanging • Sinking
Expanding • Grooving • Threading • Reducing
Double Lap Flaring • Double Lap Flanging

on Tubing up to 6"Diam.

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GEORGE L.
# *Detterbeck Quality Tools*
SPEED UP
Screw Machine Production

SELECT YOUR NEEDS FROM THIS LIST

*We specialize in*
CUTTING CAMS
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HIGH SPEED STEEL AND CARBIDE FORM TOOLS
•
SPECIAL CUTTING TOOLS
SPLIT DRILL BUSHINGS
•
CROSS SLIDE KNURL HOLDERS
•
TOOL BITS
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BOX TOOLS
•
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•
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•
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•
FORMING SWING TOOLS

We manufacture cams and tools for the trade on a production basis. As a result we offer:
1. Superior type tools . . . at low cost.
2. Practical design accuracy.
3. Correct specifications which insure maximum service.

Your tool requirements in our hands is your guarantee of better tools at a great saving.

### PROMPT DELIVERIES
Tool making with us is a routine matter. Special equipment . . . skilled hands . . . plus know how, enables us to fill orders in a minimum of time.

### SERVICE
Let us quote on your tool requirements. You'll save money . . . even as compared with "home made" tools.
Standard circular form tools for B&S and Davenport Machines carried in stock. Immediate delivery.

Established 1911
44 years at the same address.
Our service is nation-wide.
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GEORGE L. DETTERBECK CO., Incorporated, 1871 Clybourn Ave., Chicago 14, Ill.
*ENGINEERS TO AN INDUSTRY*

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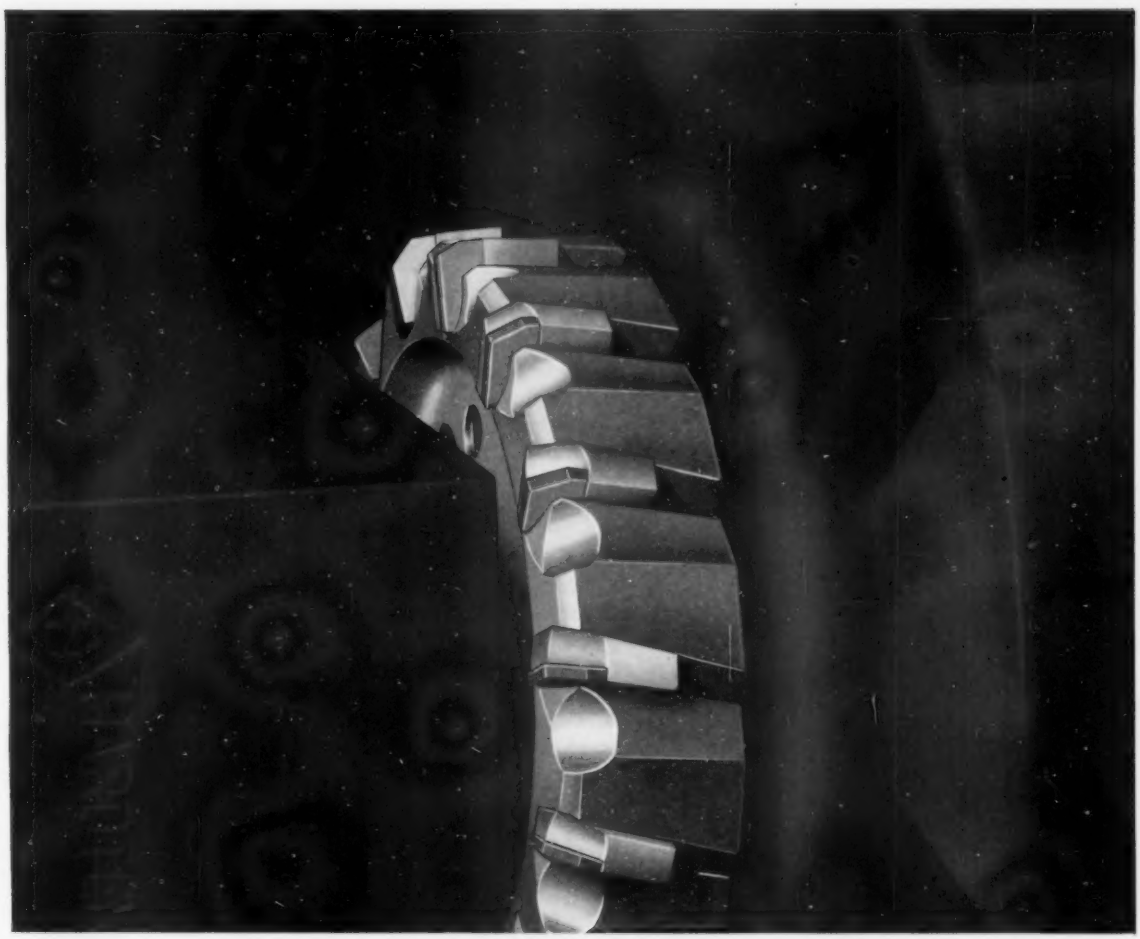


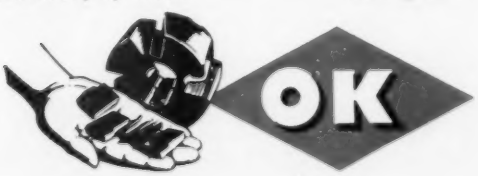
# How Heppenstall's hogmill forged die blocks with OK facemills

*Close-up made at Heppenstall's Bridgeport shows a 1500 pound, 12 x 20 x 20 inch, Hardtem B forged die block being rough milled with a 14 inch O K 9614XX, extra heavy-duty carbide insert blade facemill, incorporating 10 degree negative axial and radial rake angles. Feed, 150 surface feet per minute. Speed, 8½ inches per minute. Depth of cut, ¼ to 5/16 and often up to ½ inch. Machine, a rebuilt vertical miller with 60 horsepower motor and heavy fly wheel.*

IT IS THE SAME STORY EVERYWHERE. Tool engineers prefer O K carbide insert blade cutters for all kinds of tough milling operations . . . facing steel forgings, die blocks, locomotive driving rods, steel castings. There's a reason for this preference. It can be demonstrated by counting the minutes and measuring the metal removed. O K cutters are scientifically designed with various combinations of positive and negative axial and radial rake angles. Scientific designing directs the cutting forces into the body of cutter instead of transversely to the cutting edges. This is necessary because carbides have high compression strength and low transverse rupture strength.

O K cutters are the simplest, the strongest and the toughest ever built. They are heavier, huskier, with more beef in the body. The simple two-piece construction — body and blade — provides more strength and weight to better stand the heavy pull of high powered modern milling machines. Blades are wedge-shaped blocks, the wedge being the strongest mechanical device man has devised. One side of each blade is serrated. Matching serrations are cut into the body. Blades are self-locking, cannot tip or slip. No pins, screws, gibs or locks are needed. To compensate for wear, blades are stepped out one serration and reground. A new set of blades gives you a new cutter. Put your milling problems up to our tool engineers. Write for Catalog 13.

**SEE YOU AT THE TOOL SHOW, BOOTH 633**




## modern milling cutters for modern milling machines

**THE OK TOOL COMPANY, Milford, New Hampshire**

# *Announcing...*

**. . . THE ADDITION OF PRECISION END MILLS TO THE ECLIPSE COUNTERBORE CUTTING TOOL LINE** with the acquisition of WADELL TOOLS of North Branch, New Jersey!

These end mills, widely acclaimed in the industry, are unique in that their flutes and lands are ground in one continuous operation from solid hardened blanks. This insures identical dimensions throughout and eccentric relief rather than ground "back off". The cross-section affords maximum web strength and ideal rake contour.

Our proven precision automatic flute grinding method produces end mills giving superior performance which means longer life, finer finish and lower production costs.

For over 40 years Eclipse has specialized in hi-quality cutting tools; interchangeable carbide and high speed counterbores, countersinks, core drills and back-spotfacers. NOW precision end mills augment the ECLIPSE line making available another Eclipse tool in fields heretofore not serviced.

**SEE THIS REMARKABLE NEW LINE AT THE**

## Booth 1121

## A.S.T.E. INDUSTRIAL EXPOSITION and CONVENTION

INTERNATIONAL AMPHITHEATRE

CHICAGO • MARCH 19-23

## ECLIPSE COUNTERBORE COMPANY

1600 BONNER AVE., DETROIT 20, MICHIGAN

END MILL DIVISION—NORTH BRANCH, N. J. (ADDRESS BOX 97, RARITAN, N. J.)

IT'S HERE!... IT'S REVOLUTIONARY!

The New **Panto Marker**

*Multi-Purpose Marking Machine*

**The one versatile unit that uses all the various marking methods:**

**ELECTRIC ETCH • VIBRO ETCH • ACID ETCH • ENGRAVING**

• Now, there's no more need for a device designed exclusively for each particular marking method. You can do them all on this revolutionary, precision unit—a big saving for you in the purchase of only one machine to serve all requirements.

## Operates on the Pantograph Principle

• A font of letters and characters is furnished from which inscriptions can be arranged, and by tracing them, the inscriptions are transferred by the pantograph arrangement to the stylus or diamond point and sharp, clear impressions are made on the object to be marked. Size range of markings 1/32 to 3/16 inches in height. Adjustable work table accommodates a maximum part up to 32 inches in height with unrestricted width. Table adjusts laterally or in a circular direction.

## Add Speed, Economy, Accuracy

• The new Panto Marker is the answer! Assures uniform characters. Unrestricted capacity. Easy to operate. It's a "Must" where precision marking is required. It will save you money and time, and enable you to do a better, more accurate job.

**Marks soft and hardened materials: Plastics, Fibers, practically anything.**

MAIL THIS COUPON FOR COMPLETE DATA

AA GAGE COMPANY
353 FAIR ST., DETROIT 20, MICH.

Without obligation please rush complete information on the New PANTO MARKER to:

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Company_____

Address_____

City_____ Zone____ State_____

VISIT AA GAGE BOOTH 121
ASTE 1956 INDUSTRIAL EXPOSITION

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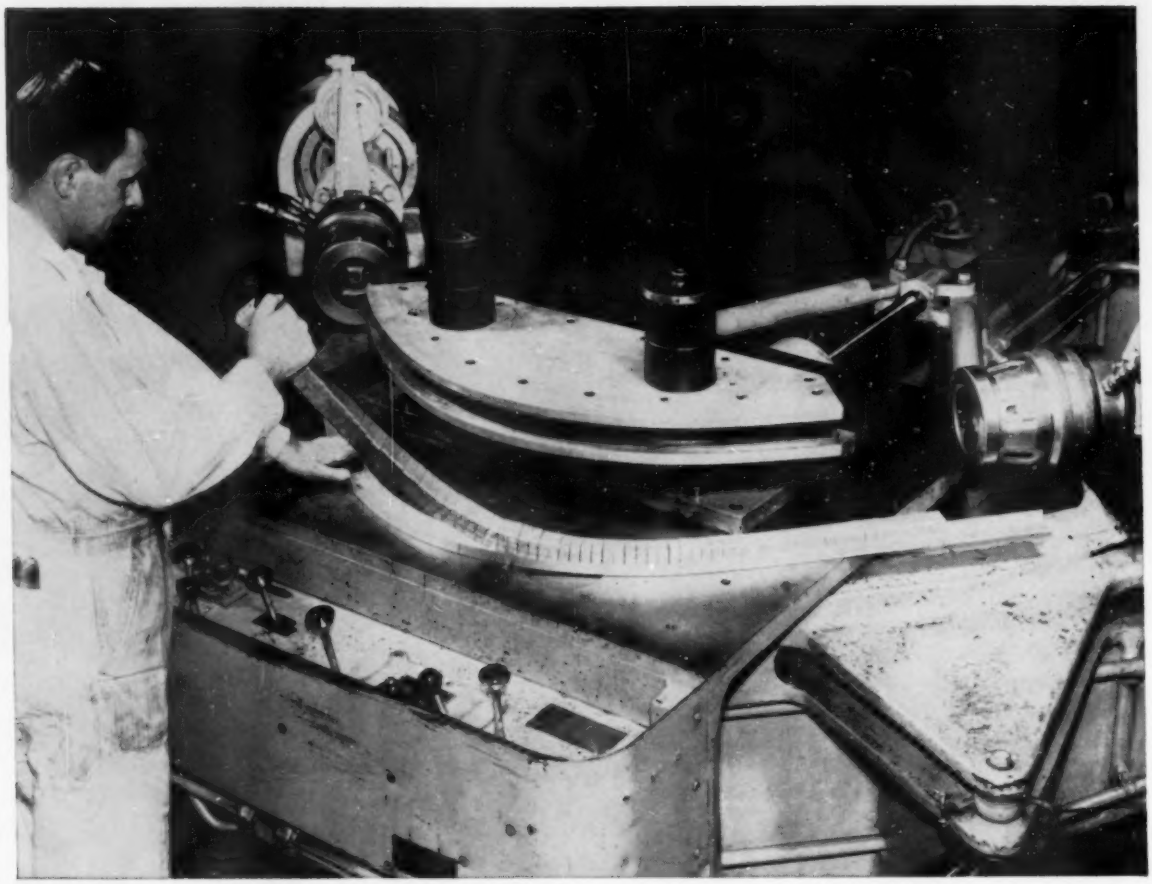
*Made with MAGNESIUM for better stretch-forming.*

DOW



**TO THE RESCUE!** Magnesium snake and tooling plate stretch-forming die has eliminated a lot of headaches for Hufford Machine Works, Redondo Beach, California. Galling, which causes scratching and excessive wear in stretch-forming aluminum extrusions, is no longer a problem since the company switched to magnesium dies. Something else, too—tool costs were cut 20%!

# NO GALLING PROBLEM HERE!

## Magnesium tooling plate solves this problem in stretch-forming aluminum

**Latest development in stretch-forming** — magnesium tooling plate. The number one reason is that magnesium's fine-grain, porosity-free structure and better slippage reduce galling to practically *nothing*.

Hufford Machine Works recently substituted dies made of magnesium tooling plate for the steel and aluminum ones they had been previously using. The result: the magnesium dies ran 500 pieces without showing wear and the aluminum extrusions showed no scratch marks!

**There are other advantages** to magnesium tooling plate. Light weight—one-fourth that of steel, one-third less than aluminum—makes magnesium dies much easier to handle and use. Excellent rigidity, strength and dimensional stability are also magnesium characteristics . . . as well as outstanding machinability and weldability.

**Ready availability and lower prices** complete the magnesium tooling plate picture. It's a picture you should look into to solve your own tooling problems! For further information, call your nearest Dow Magnesium Distributor today or write THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. MA 369L-1.

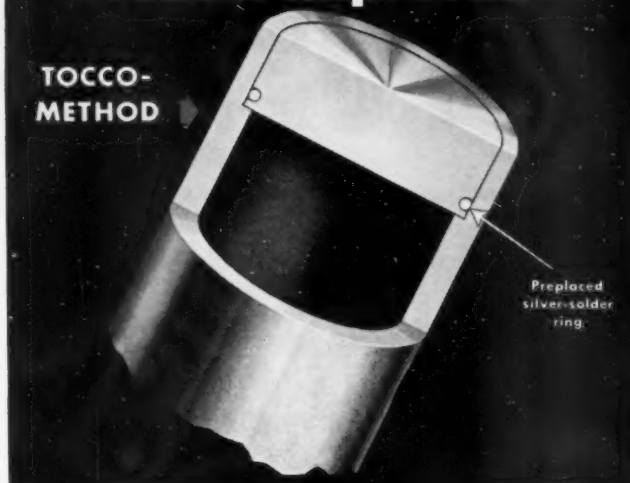
**DISTRIBUTORS:** COPPER AND BRASS SALES, INC., Detroit, Mich. • FULLERTON STEEL AND WIRE COMPANY, Chicago, Ill. • HUBBELL METALS INC., St. Louis, Mo. • A. R. PURDY CO., INC., Lyndhurst, N. J. • RELIANCE STEEL COMPANY, Los Angeles, Calif.

**Visit the Dow Booth #362 at ASTE Exposition, March 19-23**

*you can depend on DOW MAGNESIUM*

DOW

# Production Doubled
# Cost Cut 50%
# Product Improved...



*TOCCO heating station with inductor and fixture for silver brazing cylinder and cylinder cap assemblies.*

# with TOCCO* Induction Heating

The experience of The Commercial Shearing and Stamping Company, who use TOCCO for silver-brazing hydraulic cylinder assemblies, is typical of the benefits obtained by America's leading metal-working plants who use TOCCO Induction Heating for brazing, hardening, heat-treating, forging and melting operations.

**More Production with TOCCO**

a. Heating time per piece cut from 15.3 minutes to 2 minutes on 5¼" I.D. cylinder.

b. Machining and cleaning operations, formerly required, are not needed after TOCCO brazing.

**Lower Costs with TOCCO**

a. Through a reduction in time required for each piece.

b. Through the elimination of scrap and reworks.

c. Because, since TOCCO is automatic, operator need not be trained or especially skilled.

**Improved Product with TOCCO**

a. Because of better looks and sales appeal.

b. Because distortion is minimized.

c. Because of elimination of field failures due to severe stress pockets.

**TOCCO Engineers** — can probably find applications in your plant, too, where TOCCO Induction Heating can increase output, cut unit costs and improve your product. Such a survey costs you nothing—and may save you a great deal.

**THE OHIO CRANKSHAFT COMPANY**

**TOCCO**

"Trade Mark Reg. U. S. Pat. Off.

*Mail Coupon Today*

NEW **FREE** BULLETIN

**THE OHIO CRANKSHAFT CO.**
**Dept. G-3, Cleveland 1, Ohio**

Please send copy of "Typical Results of TOCCO Induction Brazing and Soldering."

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Position_____

Company_____

Address_____

City_____ Zone____ State_____

# HOW YOU CAN SAVE THIS ALL-PURPOSE

ANOTHER DENISON FIRST
DENISON MULTIPRESS
SIMPLE TO INSTALL
Only 24" high, 12½" wide, 19½" deep.
EASY TO SET UP
Ram pressures to one-ton with peak operator safety.
8" OF DAYLIGHT WITH 3" STROKE
for easy setup of dies and fixtures.

# MONEY WITH PRESS

## New! 1-TON DENISON Hydraulic Multipress® featuring pressure reversal

Industry's most versatile production tool that:

**SIMPLIFIES OPERATIONS** because Multipress cuts down operator fatigue. There is no pulling of levers . . . no kicking pedals.

**INCREASES PRODUCTION** because Multipress cycle time is *faster.*

**PRODUCES HIGHER QUALITY WORK** because ram pressure and time dwell are precisely duplicated *on every stroke.*

**IS COMPLETELY SAFE TO OPERATE . . .** safeguards against accidental tripping.

***And gives you these plus benefits:***

Precision ram alignment with tools and fixtures.

Faster setup with plenty of daylight. Easier adjustment of ram pressure.

Longer die life because Multipress eliminates damage to tools through improper loading of parts.

**THE DENISON ENGINEERING COMPANY**
1160 Dublin Road • Columbus 16, Ohio
*A Subsidiary of American Brake Shoe Co.*

DENISON HydrOILics

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Marking
Punching
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Brass
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Plastics
Leather
Glass
Wood
Rubber

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**THE DENISON ENGINEERING COMPANY**
**1160 Dublin Road, Columbus 16, Ohio**

**MY APPLICATION**

| Type of Operation | Type of Material |
|---|---|
| ☐ Assemblying | ☐ Steel |
| ☐ Marking | ☐ Brass |
| ☐ Punching | ☐ Aluminum |
| ☐ Trimming | ☐ Plastic |
| ☐ Broaching | ☐ Glass |

☐ Have Salesman Call

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Address _____
City _____ Zone ____ State _____
Your Name _____
Position _____

# TRIPLE ECONOMY *WITH* HELLER SAWING OPERATIONS

**WHEN YOU HAVE ALL THREE UNITS FROM ONE SOURCE**

## 1 THE COLD SAW

MODEL SSH-630-A
AUTOMATIC COLD METAL
SAWING MACHINE

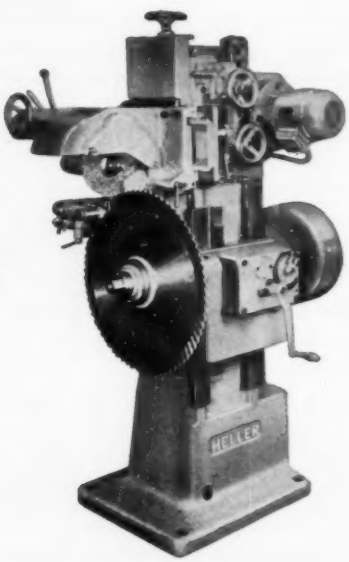
**TRIPLE ECONOMY *with* HELLER**

1. The Cold Sawing Machine
2. The Blade Sharpener
3. The Circular Sawblade

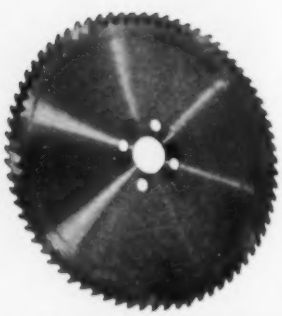
Economies are effected on every operation involved in cold metal sawing by taking advantage of the complete service available through Heller.

The specific savings offered by the use of the combination of Heller Cold Metal Saws, Heller Blade Sharpeners and recommended Sawblades becomes accumulative when used with each other.

## 2 THE SAW SHARPENER




MODEL B-650
AUTOMATIC SAW SHARPENING
MACHINE

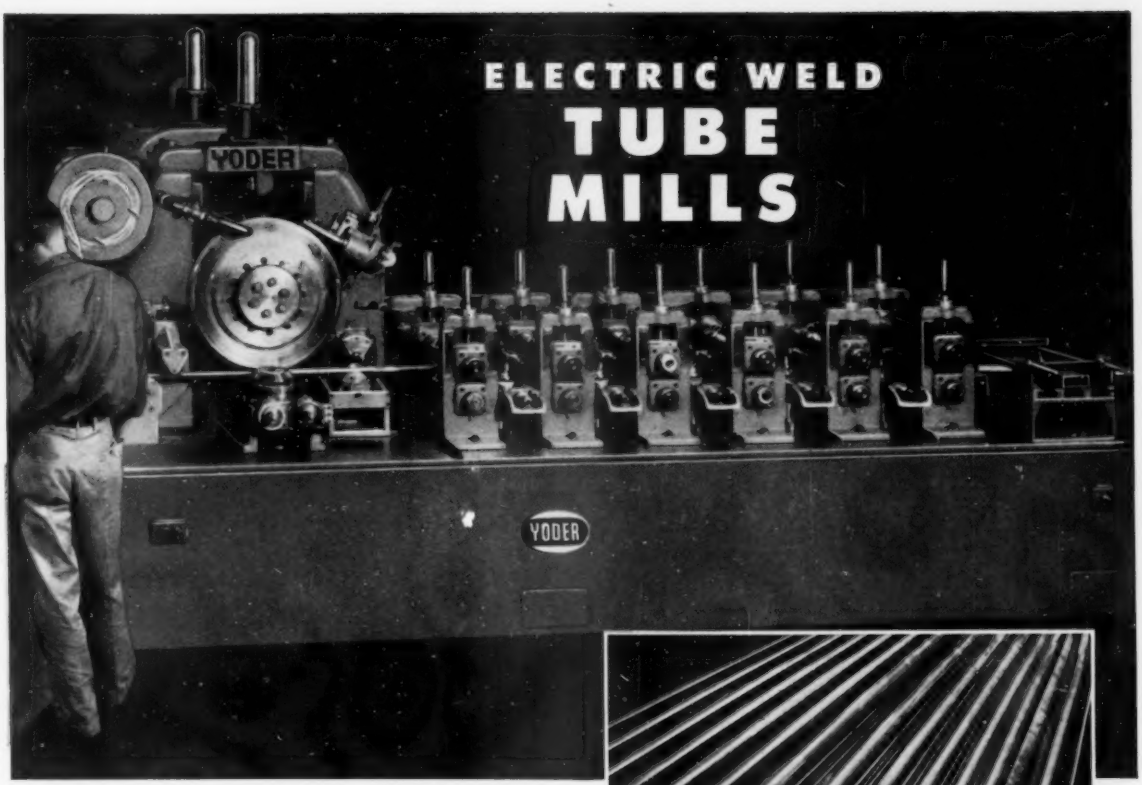


HELLER GIVES YOU COMPLETE SERVICE
WITH EXACTLY CORRECT BLADES.

## 3 THE SAW BLADE

**HELLER MACHINE COMPANY**, 114 Liberty St., New York 6, N. Y.

**KNEE AND PLANER TYPE MILLING MACHINES • RADIAL AND COLUMN DRILLING MACHINES • TRANSFER MACHINES • SPECIAL MACHINES**




The photo shows the tube forming mill and welder of a complete Yoder mill recently installed for an Italian customer. Although it looks very much like a standard Yoder mill, it embodies special mechanical and electrical innovations designed for *tube production at speeds up to 350 fpm*—from 200 to 300% faster than heretofore considered practical by the resistance-weld process.

This is just one example of the many new things introduced by Yoder in pipe and tube making equipment, to meet widely varying production needs. Other recent Yoder developments are induction weld mills for making steel as well as nonferrous pipe and tubing, at speeds never before approached by this process, and adding greatly to its recognized economic advantages.

For more complete information about the latest technological advances in Yoder tube mill equipment, write, wire or phone

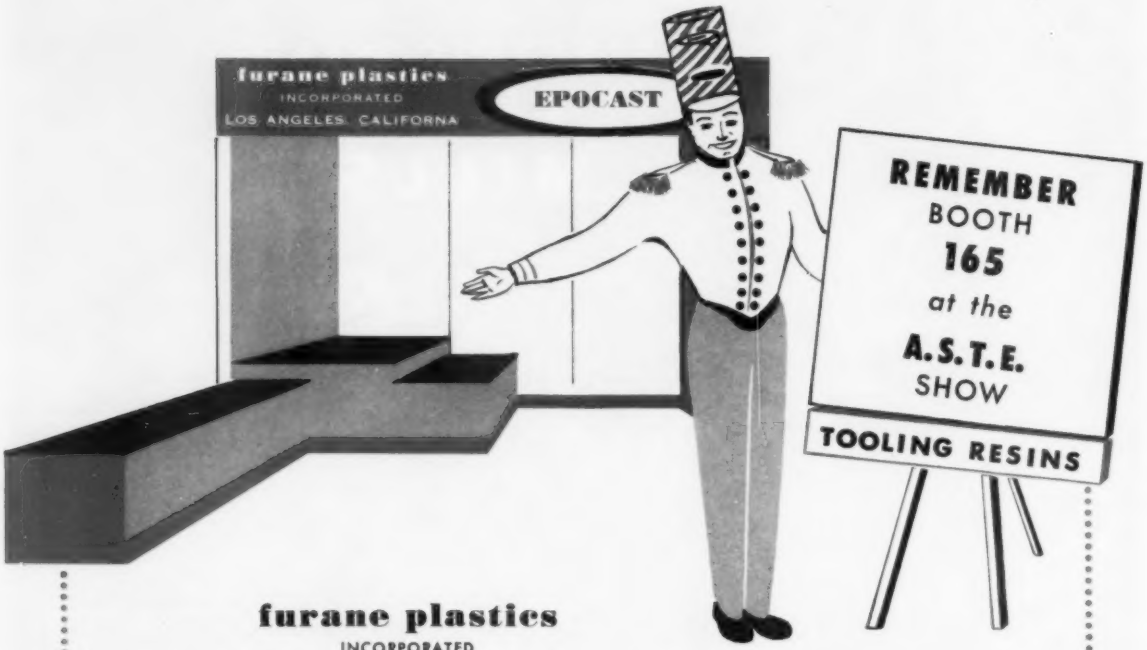
**THE YODER COMPANY**
**5525 Walworth Ave. • Cleveland 2, Ohio**

***Literature on Request:***

- ☐ **1.** Electric Weld Tube Mills for *Steel Tubes* up to 4" diameter.
- ☐ **2.** *Induction Weld* Tube Mills—sizes up to 8" diameter for aluminum, nickel, copper, brass, inconel, monel, stainless and other alloys.
- ☐ **3.** *Pipe Mills*—electric weld—for sizes up to 24" diameter.

ENGINEERING YODER MANUFACTURING

**PIPE AND TUBE MILLS—Electric Weld**
**ROTARY SLITTING LINES**
**COLD ROLL FORMING MACHINES**

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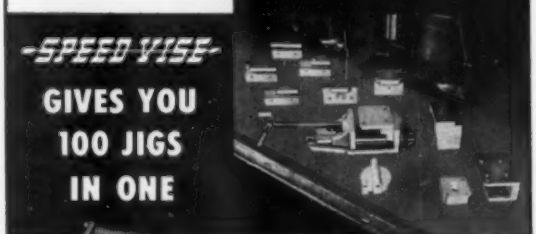
4516 Brazil Street • Los Angeles 39, California

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-422-1

**Speed Versatility and Economy**

Tooling costs go down when Speed Vise goes on the job because Speed Vise eliminates the need for expensive jigs and fixtures. Just a simple jaw plate to fit the part being drilled and Speed Vise does the rest. Several interchangeable Speed Vise jigs and fixtures can be made for the cost of one old style box type jig. The operation of Speed Vise tooling is **many times faster** than the operation of such conventional jigs and fixtures. Speed Vise tooling is economical to build, efficient to use, compact to store.

-SPEED VISE-
**GIVES YOU 100 JIGS IN ONE**



**$10.90 to $22.90**

★ Quick action design for speed. Opens instantly to full capacity to handle work of any size.
★ Standardized holes for attaching jigs or jaw plates.
★ Lift...slide...lock...that's all there is to the fast, positive locking action.
★ Heavy, semi-steel castings for extra strength and a heavy base plate for rigidity.

Write or wire now for information
**CARDINAL MACHINE CO.**
1819 Dana Street
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**Originators and Manufacturers of Helical Reamers and End Mills**

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**Helical Taper Pin Reamers Shipped by Return Mail**

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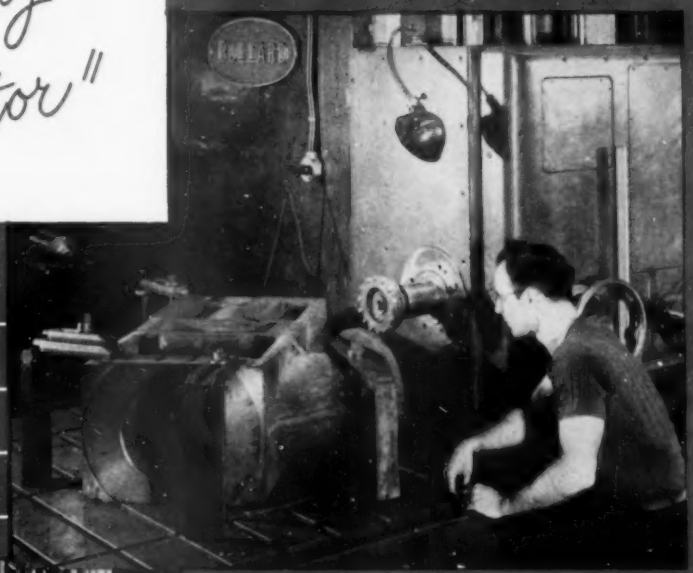
*Company*
400 Main Street, Manchester, Conn.

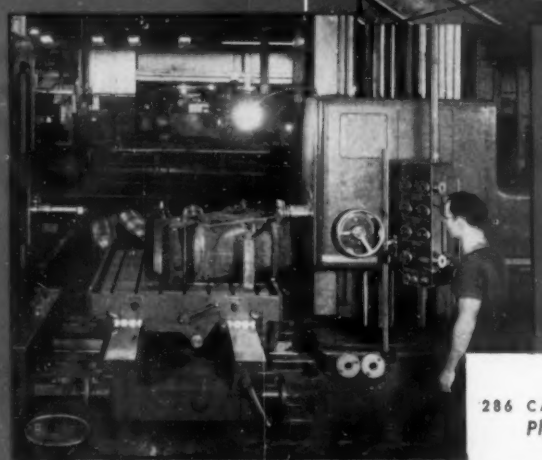
USE READER SERVICE CARD; INDICATE A-3-422-3

"... the BULLARD pendant control ... is sure handy for the operator"

Says boring mill operator at Fuller Company, Manheim, Pennsylvania, manufacturers of conveying equipment, coolers, compressors and vacuum pumps. Also, he says, "there are no levers to mess around with. On the Bullard H.B.M., Model 75, I can mill on a 45° angle in any quadrant instead of having to jockey in one direction, then in the other — like I had to do on the old machine."



the machine is outstanding for ease of operation



For full information on all the cost saving advantages offered by the Bullard Horizontal Boring, Milling and Drilling Machine, Model 75, including screw and rack feed, wide speed ranges, extra rigidity in Bed, Head, Head Post and Rear Post, optical measuring equipment (optional) and Automatic Positioning for head and table (optional),

CALL YOUR NEAREST BULLARD SALES OFFICE OR DISTRIBUTOR OR MAIL COUPON TO

THE BULLARD COMPANY
286 CANFIELD AVENUE—BRIDGEPORT 2, CONNECTICUT
*Please send me a copy of the NEW H.B.M., MODEL 75 CATALOG ...*

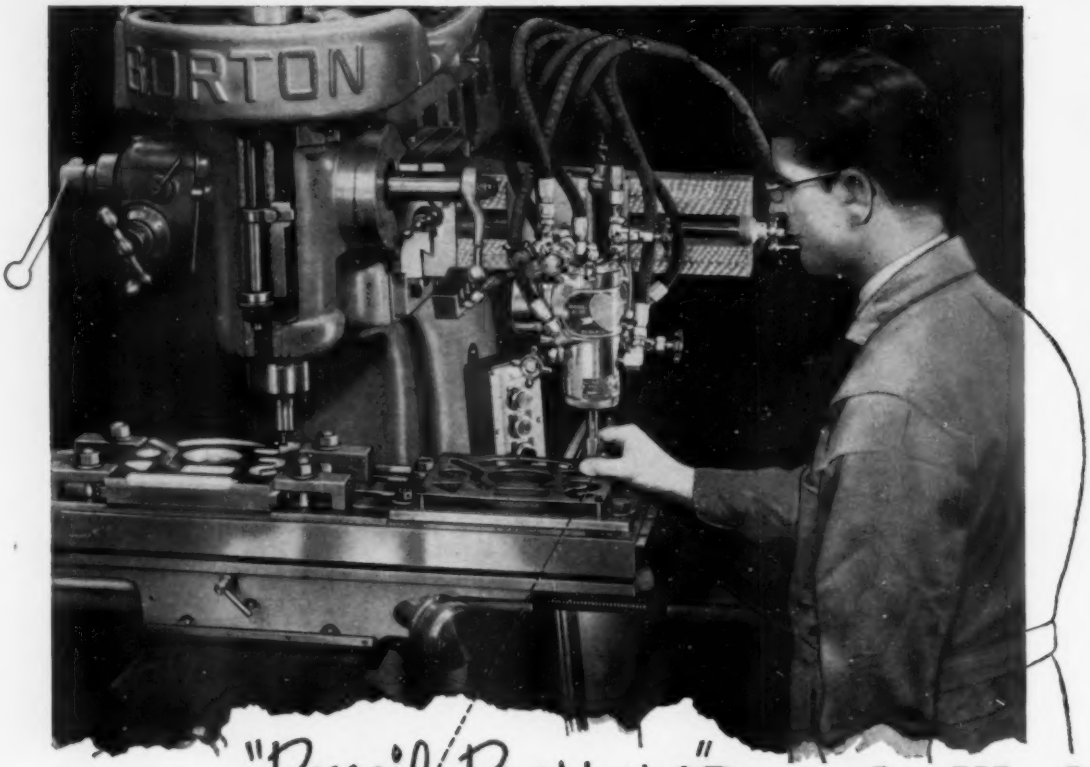
NAME_____

COMPANY_____ POSITION_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

# *Now*... Gorton Milling Machines Feature Hydraulic 3-Dimensional Controls




## "Pencil Pressure" Does the Work

Gorton now offers you several models of Super-Speed Vertical Mills equipped with sensitive and accurate hydraulic controls featuring feeds up to 40 inches per minute.

**AVAILABLE 3 WAYS**

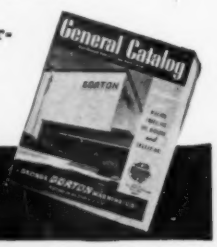
1. Vertical action only
2. Cross and longitudinal
3. Three-dimensional combination

*Gorton Milling Machines with hydraulic Tracer Control must be ordered as such. Hydraulic equipment is not an attachment but a permanent installation.*

For die or mold work (single or multiple units), production profiling and duplicating — short runs, experimental pieces or high production.

Gorton also offers manual and automatic Tracer-Controlled Milling Machines and Pantographs for 2- or 3-dimensional operation; 1 to 1 ratio, or reproduction at variable reductions, with single or multiple-spindle machines for work of any shape or size.

**Shown above: Gorton 9-J Super-Speed Vertical Mill with True-Trace hydraulic installation.**




**Write for Form 2697-ADS and 2603-1655 General Catalog.**

GORTON

SINCE 1893

**GEORGE GORTON MACHINE CO.**

**2603 RACINE ST., RACINE, WIS., U.S.A.**

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

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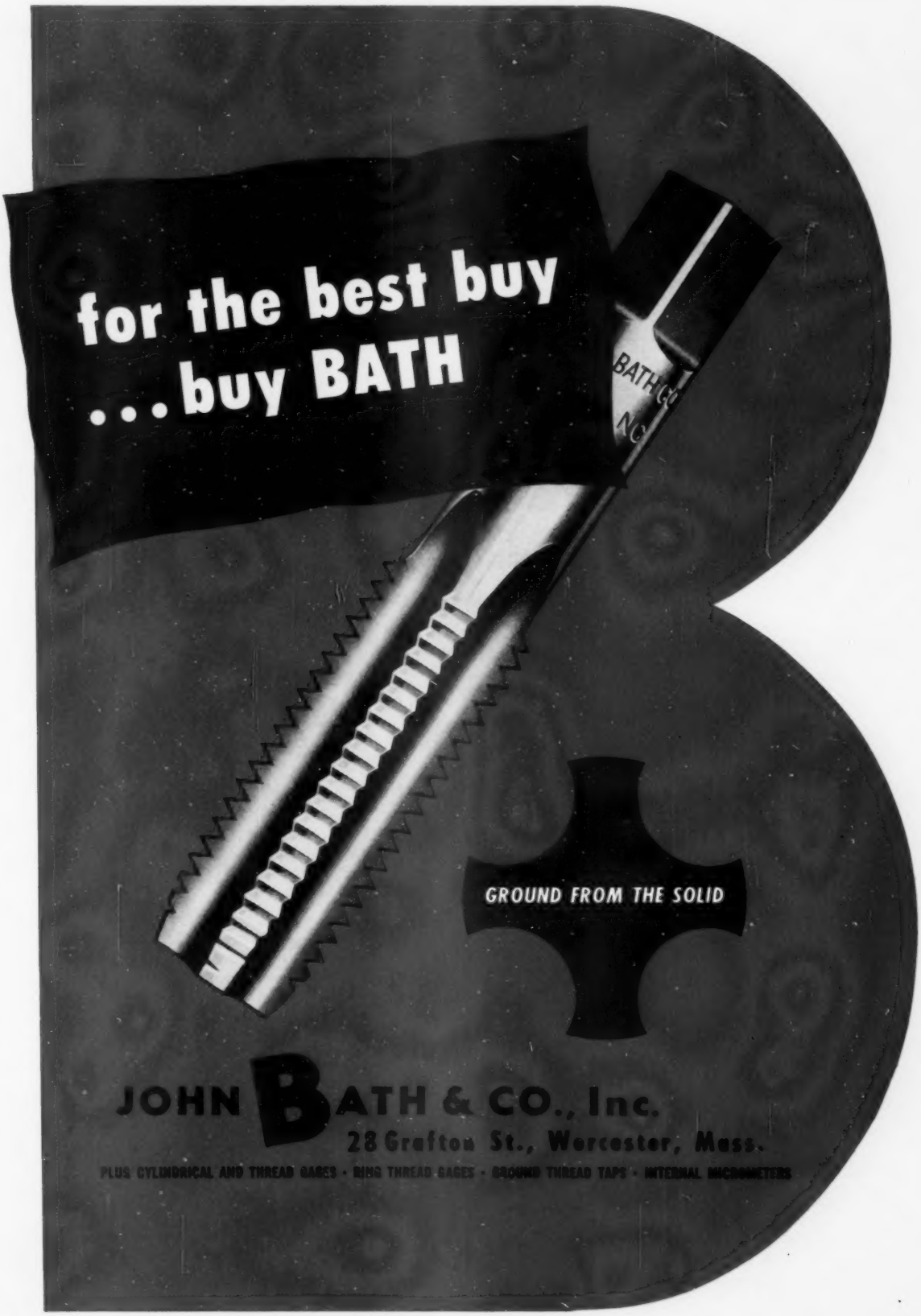
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TRADEMARK

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Air and Hydraulic
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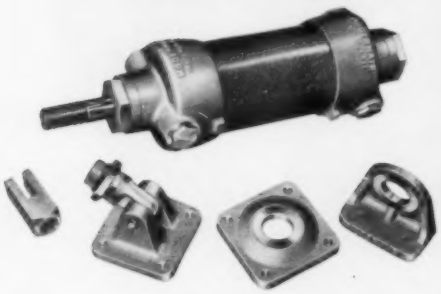

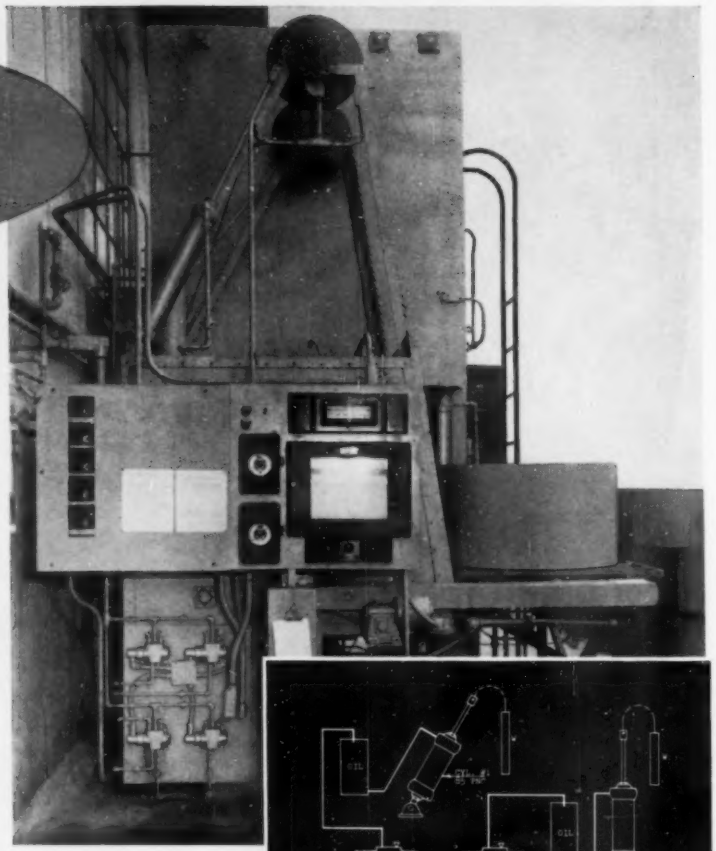

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1. Interchangeable mountings—your choice of brackets, flange, or clevis-type swivel.
2. Heads can be rotated 360° to simplify piping.
3. Standard "O" ring seals used throughout—easy to obtain and replace.
4. Corrosion resistant; designed for safe, reliable operation on air, water or oil hydraulic systems to 400 p.s.i. in 2" and 3" bores, 200 p.s.i. in 4" and 6" bores.
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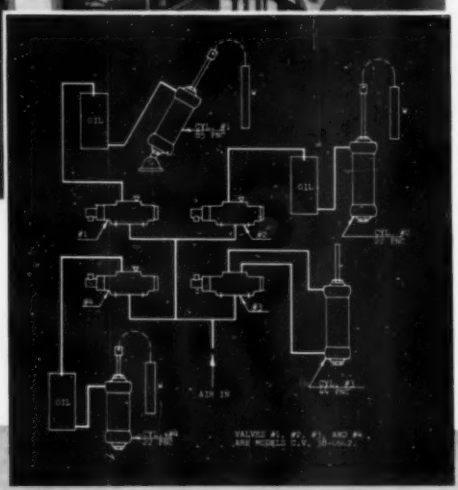
6. Prompt delivery of cylinders or parts from factory or dealer stocks in principal cities.



**AUTOMATION WITH PROVENAIR CYLINDERS...** California-Doran Heat Treating Co., Los Angeles, uses 4" bore PROVENAIR cylinders and MODERNAIR CV series solenoid-operated valves to operate furnace doors, move parts through fully-automatic heat treat cycle.

To start cycle, operator depresses button which activates valve #1 through a relay. Air pressure is applied to oil which retracts cylinder #1, raising outer door so part can be placed in preheat furnace. A timed relay closes valve #1, lowering door. A sequence timer allows part to reach proper temperature, then energizes valve #2 which activates cylinder #2 to open inner furnace door. Valve #3 then operates cylinder #3 which pulls part into central furnace. Timer then releases valves #2 and #3, returning cylinders #2 and #3. Timer then activates valve #4 controlling cylinder #4 which opens discharge door and ejects part.

7

Modernair CORPORATION

TRADEMARK

Member of National Fluid Power Association

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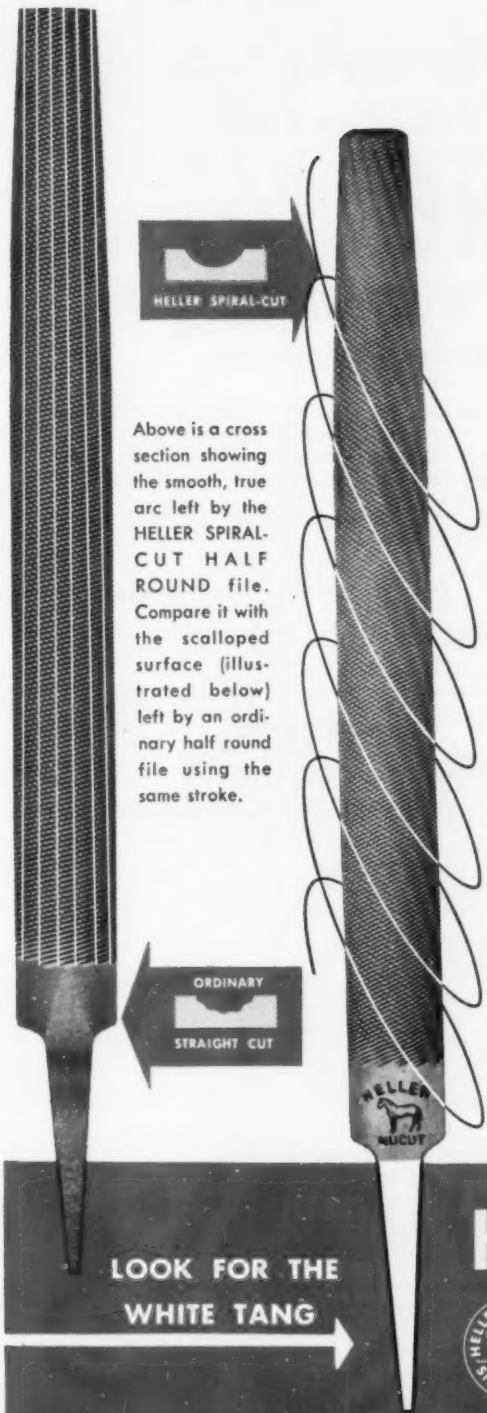
**SEE OUR DISPLAY, BOOTH 237, A.S.T.E. INDUSTRIAL EXPOSITION, CHICAGO—MARCH 19-23**

# *The Rolling Action is built right in*

# HELLER
## *Spiral-Cut*
## half round files




Above is a cross section showing the smooth, true arc left by the HELLER SPIRAL-CUT HALF ROUND file. Compare it with the scalloped surface (illustrated below) left by an ordinary half round file using the same stroke.

Filing out a concave surface or rounding out a hole is no longer a job restricted to master craftsmen. HELLER SPIRAL-CUT HALF ROUND files eliminate the need for skillful twisting action once so necessary to produce smooth, even work. This rolling action is now designed right into a HELLER SPIRAL-CUT HALF ROUND file.

A straight stroke with an ordinary half round file leaves bumps and ridges unless the user twists it just right. The same straight stroke with a HELLER SPIRAL-CUT HALF ROUND makes a smooth and true-arc surface.

Everyone gets perfect results with this new SPIRAL-CUT, an *exclusive* feature of HELLER HALF ROUND files. This new cutting principle is another of many "firsts" brought out by HELLER in their continuous search for a better file.

these brands always assure HELLER quality

HELLER *American-Swiss*® SWISS PATTERN

VIXEN® MILLED CURVED TOOTH

NUCUT® AMERICAN PATTERN

LOOK FOR THE WHITE TANG

**HELLER TOOL CO.**

A subsidiary of Simonds Saw and Steel Company

NEWCOMERSTOWN, OHIO

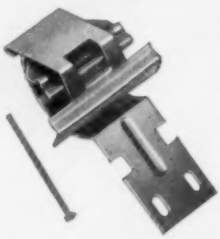
Branches: New York, Detroit, Chicago, Los Angeles

HELLER TOOL CO. SINCE 1856

**YOUR *HELLER* DISTRIBUTOR CAN SUPPLY ALL YOUR FILE NEEDS**

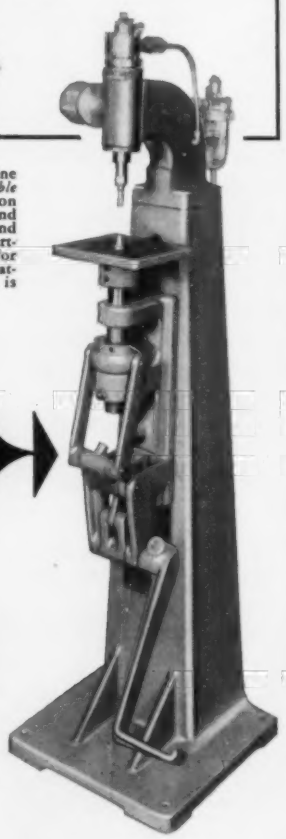
# THE ANSWER
## to some *difficult* RIVETING PROBLEMS

**For Example:**



The long pin in this hinge assembly is ½" x 2½" and was being distorted and excessively peined. On the HILL RIVETER, with controlled time cycle and adjustable impact, a perfect job is done every time in 2 seconds at 15 psi.

This air-operated riveting machine produces *accurately controllable* results that cannot be obtained on ordinary machines. It is fast and efficient, extremely versatile, and easily adaptable for either short-run or mass-production jobs. For regular solid riveting, it is unbeatable; for difficult problems, it is *The* Answer.



**THE HILL PNEUMATIC RIVETING MACHINE**

Essentially, the machine consists of a revolving, air operated, reciprocating hammer, working against an anvil which is adjustable in a rigid bracket. Many important details have been worked out for convenience, for neat appearance, for long life, and for superior performance. *For all details, and complete specifications, write for free bulletin: "High Speed Production Riveting."*

**HILL MACHINE COMPANY**

1301 EDDY AVE., ROCKFORD, ILLINOIS

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# IF

**You Must Cut Production Costs**

# THEN

**ELIMINATE MACHINING! in the following operations:**

- **Accurate location and securing drill jig bushings,**
- **Anchor bearings and parts in machinery,**
- **Anchor bushings in abrasive wheels,**
- **Center and secure shafts in Alnico rotors.**

Write for Bulletin A1 today—it tells how. Better still—come see our demonstration at Booth #773, A.S.T.E. Exposition—Chicago, March 19-23. See above and many other applications.

**CERRO DE PASCO CORPORATION**
296 Park Avenue, New York 22, N.Y.

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**DYKEM STEEL BLUE**

Stops Losses making Dies and Templates

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench: metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

*Write for sample on company letterhead*

THE DYKEM COMPANY
2303D North 11th St. • St. Louis 6, Mo.

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**HART MILLING FIXTURES**
"Masters of A Thousand Set-ups"

**eliminate expensive jigs and fixtures**

Hold any shape stock aligned with miller, shaper, drill press or tapper. Famous for key-way setups. Value proven in large and small shops. 4 sizes

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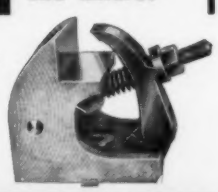

WALTER W. FIELD & SON INC.
39 HAYWARD STREET, CAMBRIDGE 42, MASS.

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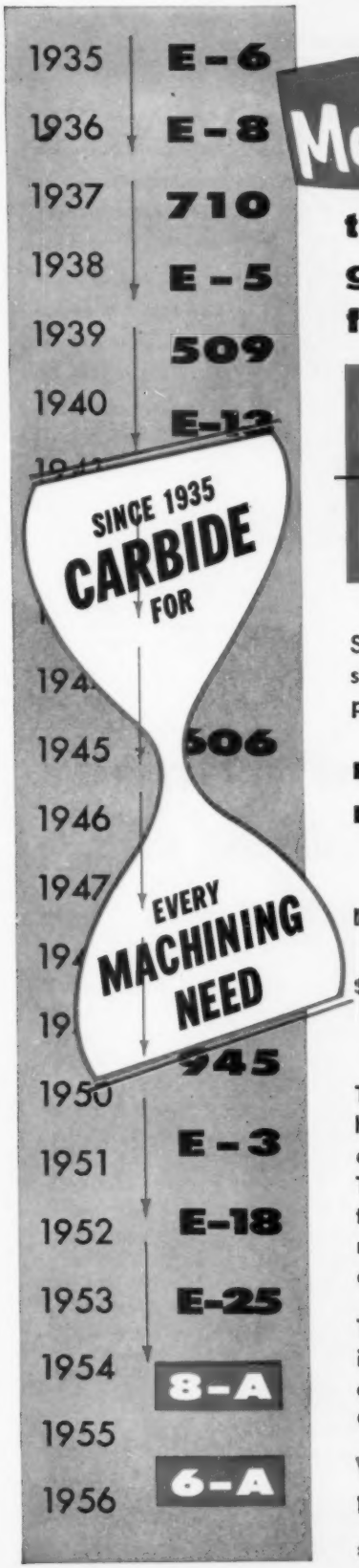



# Meet Willey's Series "A"

## two new steel cutting grades join WILLEY'S family of industrial carbides

**8-A** for roughing cuts

**6-A** for finishing cuts

Specifically designed for machining tough steels, alloy steels and high tensile strength steels, they thoroughly prove their superiority in actual production runs.

**Permitting** 30% higher feed and speed rates.

**Producing** Up to 8 times more finished pieces per grind than previous steel cutting carbides.

**Increasing** Automatic machining operations as high as 146%.

**Setting** New production records in Automated machining operations.

These two—totally new—**Vacuum Sintered Carbides** have a purity and uniformity in structure that provide a consistent quality not found in previous carbides. The far greater edge strength coupled with exceptional wear qualities and increased cratering resistance offer the users—the best tool performance and—top production results.

TRY—SERIES 8A & 6A, they are available from stock in standard blank sizes. Prompt delivery on pre-formed blanks made to your specifications. Call your Willey's distributor or write:

**WILLEY'S CARBIDE TOOL COMPANY**

**1340 W. Vernor Hwy. · Phone Woodward 1-9444 · Detroit 1, Michigan**

**see us at the tool show . . . booth 653**



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-429

# still the winner

## ... and in high speed steels, nothing beats REX

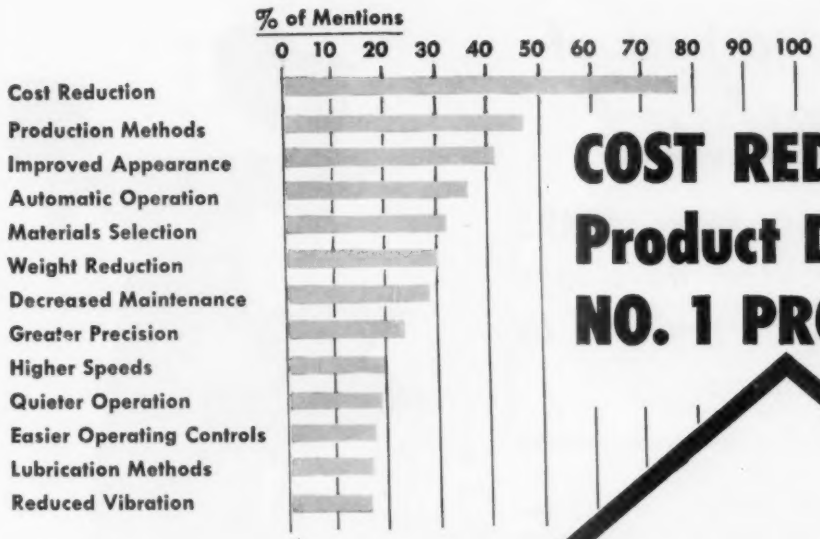
The winner and still champion after fifty years is Crucible's REX high speed steel. *And now it's better than ever!* Recent improvements in manufacturing processes have given even higher quality and greater uniformity to every one of its properties.

Why not shop test the new REX yourself? Test it for size, structure, response to heat treatment, fine tool performance. Give it any test you wish. You'll see why it is today, as it has always been — *the standard by which all other high speed steels are compared.*

Ask for REX by name at your local Crucible warehouse. Or order it directly for prompt mill delivery. And for information on REX, and the other Crucible special purpose steels, send for the *Crucible Publication Catalog. Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

**CRUCIBLE** first name in special purpose steels

**Crucible Steel Company of America**




Tabulated results of a recent survey showing the problems receiving greatest attention from Product Designers.

# COST REDUCTION is Product Designers' NO. 1 PROBLEM . . .

# AND NICE CAN HELP LOWER COSTS

**Product Designers will find many cost-saving advantages in the use of NICE precision, semi-precision and unground ball bearings. Experienced NICE Engineers can not only help in the selection of the proper standard bearings, but can design "exactly right" special bearings to meet particular application requirements.**

**WRITE FOR CATALOG No. 150**

NICE

## NICE BALL BEARING COMPANY

NICETOWN · PHILADELPHIA · PENNSYLVANIA

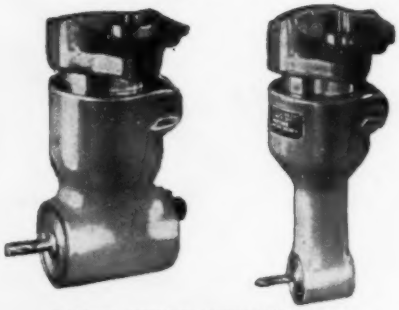
# *The Basic Idea back of* **Bridgeport**

## TURRET MILLING MACHINES

*was conceived, created, developed and made universally practical by BRIDGEPORT Engineers.*

UNIVERSAL acceptance of Bridgeport Millers has established beyond the shadow of a doubt that the basic principle in these machine tools is *RIGHT*. It also means that there was a definite need for a machine of this type to replace other machines which had outlived their usefulness. It means, too, that Bridgeport Turret Milling Machines can be installed in any shop for tool room or production line without radically upsetting procedures which have been in conventional use.

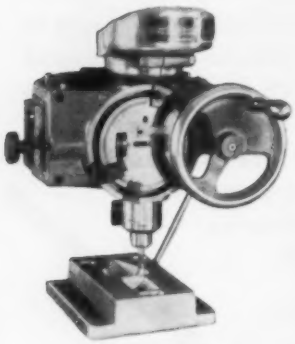
BRIDGEPORT MILLERS have met existing conditions universally. Careful production planning in Bridgeport's own new shop has made it possible to offer *exclusive* advantages at a maintained reasonable price, a fact which indicates that their designers and manufacturers have made an outstanding contribution to modern metal working progress.



**RIGHT ANGLE ATTACHMENTS**

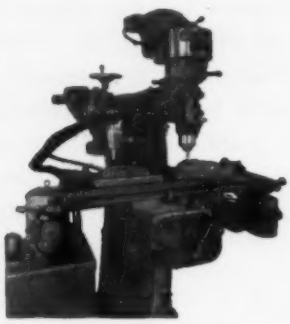
(Above) Heavy Duty . . . for milling and drilling at right angles; fits both Master and 1 HP Bridgeport Heads.

(Above) Light Duty . . . for right angle milling and drilling narrow, deep molds and cavities.



**CHERRYING ATTACHMENT**

Makes possible production of convex and concave shapes, Ideal for producing drop forge dies, molds, cavities.



**TRUE TRACE COMBINATION**

The Bridgeport True Trace Combination will give excellent performance and save endless hours when copying irregular dies and molds.

**NO. 2 BORING HEAD**

Boring Tools and Holder provide means for boring holes up to 6" diameter; available for use on Bridgeport 1 HP Milling, Drilling and Boring Attachment.

*Investigation of Bridgeport Milling Machines and their many attachments is always in order*

**Bridgeport MACHINES, INC.**

Bridgeport, Connecticut

*Manufacturers of High Speed Milling Attachments and Turret Milling Machines*

# WHEREVER YOU NEED ACCURATE HOLES

**PARTS PRODUCTION**
Fast sizing and finishing in one operation. Makes holes geometrically perfect—accurate to .0001". Finish to 2 micro-inches RMS in hardened steel.

**PRODUCTION SALVAGE**
Low cost sizing of parts partially completed in mass production. Correct reject parts: taper, out-of-round, improper finish.

## YOU NEED SUNNEN HONING

**GENERAL MACHINE SHOP**
Many uses: sizing or fitting all kinds of parts—in any hardness. Making special parts. Hold tolerances of .000025" in tool and die work, if needed.

**MAINTENANCE DEPT.**
Fast sizing of repair parts, fitting matched parts or bearings . . . reconditioning worn, hard-to-replace parts.

DIA. RANGE ⅛" TO 2½"

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STOCK REMOVAL—GEOMETRIC ACCURACY
PRECISION SIZING—FINISHING

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BOOTH 474—MARCH 19-23
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(CASE HISTORIES AND TECHNICAL INFORMATION)

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COMPANY_____
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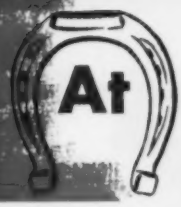
CITY _____ ZONE____ STATE____



# At Latrobe . . . the horse came before the cart!

## DESEGATIZED®

***Process of Manufacture***

## XL® High Speed Steels
## FM Die Steels

Latrobe's DESEGATIZED® high speed steels and high carbon-high chromium die steels have a uniformity in their structures . . . an overall, even distribution of wear-resistant carbide particles . . . a result of the DESEGATIZED® process of manufacture.

Now, through that same DESEGATIZED® process, Latrobe produces XL® high speed steels and free-machining FM die steels containing evenly distributed alloy sulphides. These uniformly dispersed sulphide additives create an internal lubricating action resulting in improved machinability characteristics and better tool life in many applications. No sacrifice of mechanical properties or heat treating procedures to gain this extra machinability! Without exception, the extra toughness, greater wear resistance and other advantages of DESEGATIZED® steels are found in XL® and FM steels.

**The development of DESEGATIZED® steels had to precede the "free machining" development since the successful performance of free machining steels is dependent upon the uniform dispersion of sulphide additives. The horse had to come before the cart!**

For complete details on DESEGATIZED® XL® high speed steels and free machining FM die steels, call your local Latrobe representative. He will be pleased to show you all the advantages of Latrobe's tool and die steels and the vast range of stock sizes available from conveniently located warehouses.

TOMORROW'S TOOL STEELS TODAY! . . . WHEN YOU NEED THEM

# Latrobe Steel Company

MAIN OFFICE and PLANT: LATROBE, PA.

Branch Offices and Warehouses Located in Principal Cities

VISIT OUR BOOTH 431 AT THE 1956 ASTE SHOW

# TAPS *by* Card

The CARD Quality

When you specify Taps or Gages *by Card*, you know you're getting the finest. Card's long experience in the manufacture of precision tools is your guarantee of satisfaction. In every industry the superior performance of Card taps and gages is speeding production, helping to turn out better products faster.

*Presenting the Symbol of Service*

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S. W. CARD MANUFACTURING CO., Mansfield, Massachusetts
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# GAGES *by* Card

TAPS · DIES · SCREW PLATES · GAGES



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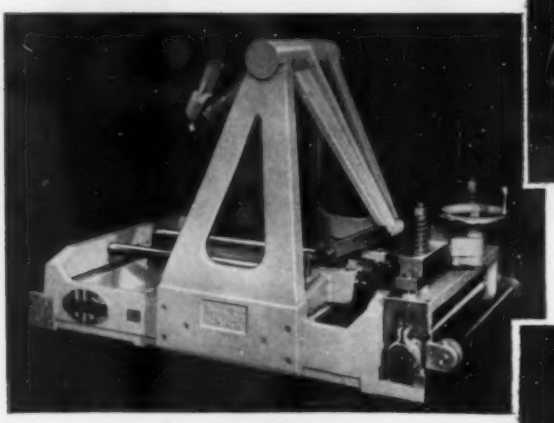
# UNCOVER THE HIDDEN PROFITS IN YOUR PRESS ROOM!

U.S. Slide Feed, Plain Straightener, and U.S. Multi-Roll Cradle used in conjunction with conventional O.B.I. Press.



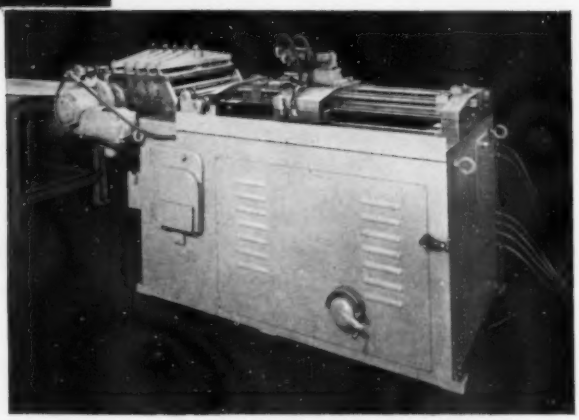
Smallest and largest sizes of U.S. Slide Feeds which we now build. To the left, Model SF-24-24 capable of handling material up to 24 inches in width, with feed length adjustable up to a maximum of 24 inches. To the right, Model SF-00 capable of handling material up to 1½ inches in width with feed length adjustable up to a maximum of 1 inch.

## WITH

# U.S.

## AUTOMATIC PRESS ROOM EQUIPMENT

**See our exhibit at Booth 375**
**ASTE Industrial Exposition**
**International Amphitheatre**
**Chicago, Illinois, March 19-23, 1956**



SFC-24-24 U.S. Cabinet Mounted Individually Motor Driven Slide Feed capable of handling material up to 24 inches in width, with feed length adjustable up to a maximum of 24 inches at one stroke. Equipped with Stock Straightener with a pair of Motor Driven take-in rolls suitable for material up to .060 in thickness. This feed can be cycled to obtain feed lengths over 24 inches.

By converting your presses into automatic machines you are able to reduce piece part costs. You, like all other manufacturers, are interested in attaining this end result. The units illustrated above are only a few of the different types of Feeds, Straighteners, Coil Cradles and Stock Reels included in our line. These and our other units have been designed and built with the end result of "Automatic Operation" in mind.

To keep pace with the requirements of stamping manufacturers, we will exhibit and demonstrate a number of completely new units in our Press Room Equipment line at the ASTE Industrial Exposition, International Amphitheatre, Chicago, Illinois, March 19-23, 1956.

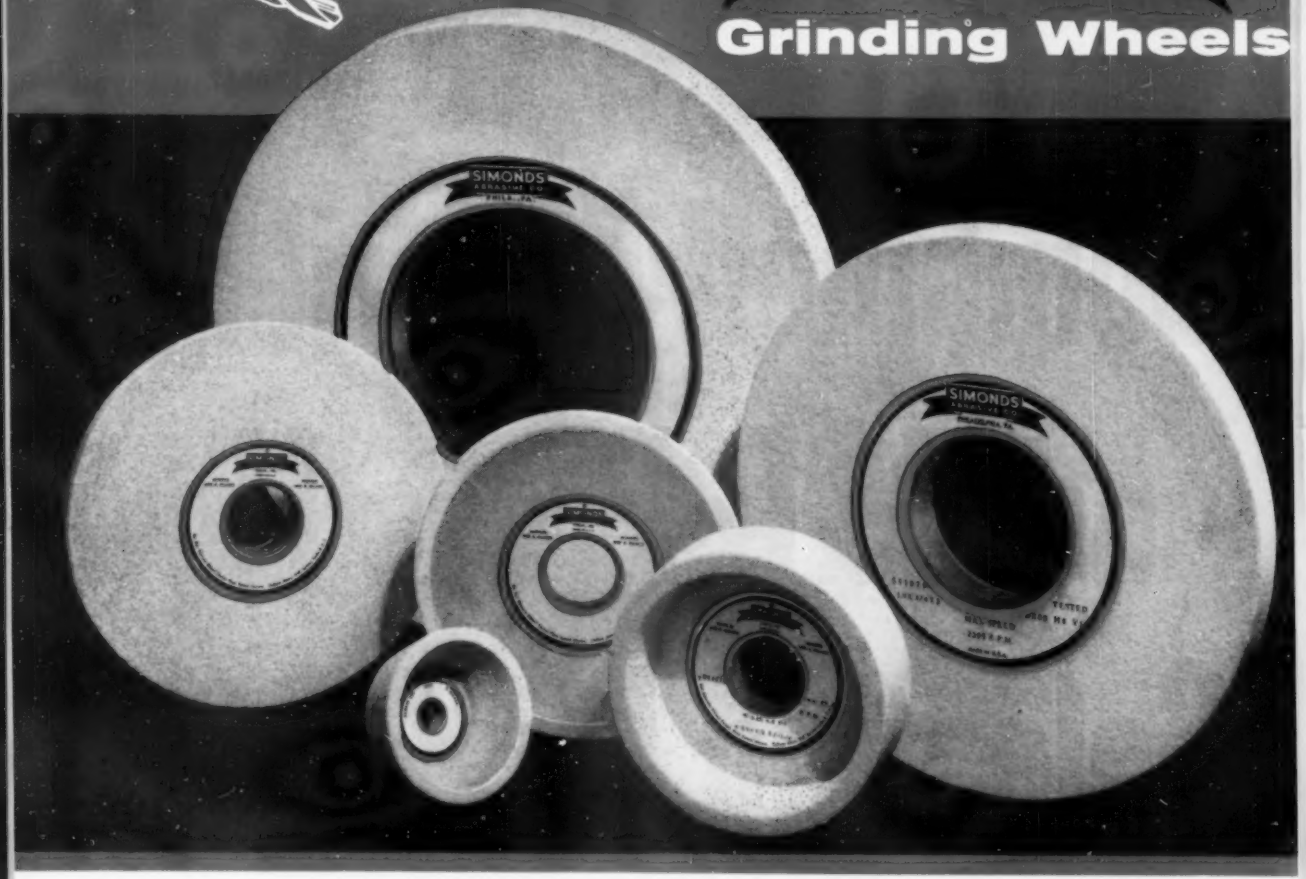
**Be sure to visit Booth 375 at the Exposition. In the meantime, send for our Bulletins No. 80-T and 90-T illustrating and describing U. S. Automatic Press Room Equipment**

# U. S. TOOL COMPANY, Inc.

**AMPERE (East Orange) NEW JERSEY**

**Builders of U. S. Multi-Slides — U. S. Multi-Millers**
**U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories**

# Get the BEST in tool and cutter performance with SIMONDS ABRASIVE CO. Grinding Wheels




## W Borolon® White Wheels

TRADE MARK

For hardened and high speed steels, high carbon, high chrome and other alloys. For fast, cool cutting action with long wheel life, these wheels belong on *your* toolroom grinders. Made with W Borolon (special aluminum oxide abrasive) for fast stock removal and the finish you want without burning expensive steels. Engineered for true concentricity and good balance. Furnished in protective plastic bags. For consistently superior results, standardize on Simonds W Borolon White Wheels.

*Send for bulletin ESA 197.*

CALL YOUR SIMONDS DISTRIBUTOR

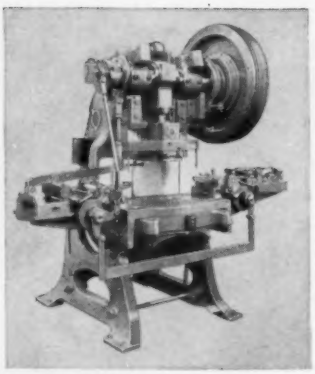
**SIMONDS ABRASIVE COMPANY • PHILADELPHIA 37, PA.**

Branch Warehouses: Boston, Detroit, Chicago, Portland, San Francisco. Distributors in Principal Cities

Division of Simonds Saw and Steel Co., Fitchburg, Mass.

LOCAL STOCK FAST SERVICE

*Which one is best?*



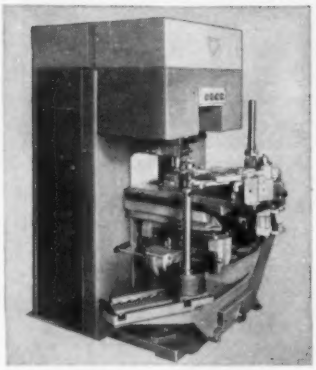
**INCLINABLE . . .**

# Combined Experience and V&O Press Now Selecting Best Press

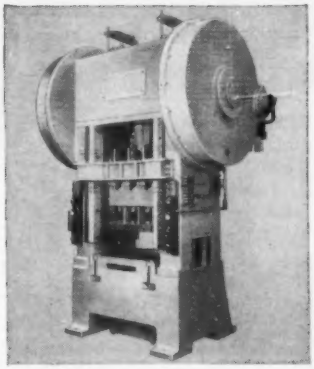
**MERGER OF HENRY & WRIGHT AND V & O PRESS** field sales organization means one source of information and assistance on the important basic types of mechanical presses. It means that you can count upon no-axe-to-grind counsel in appraising the basic type of unit best suited to your immediate and long range requirements.

You may be considering a press modernization or replacement program right now — and weighing the pros and cons of various press types. Whatever the end result you are seeking, it will pay you to consult the H & W — V & O representative nearest you. He will be glad to add his experience to yours in working out the best solution. *Why not write us for his name, or send for our digest of presses* to Press Divisions, Emhart Mfg. Co., 421 Windsor St., Hartford, Conn.

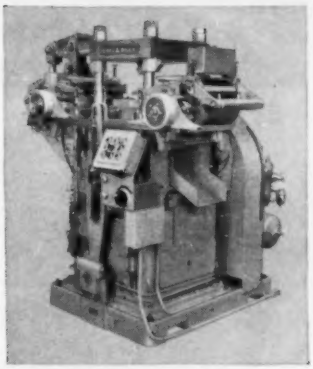
**NEW AT A.S.T.E.** V & O Blank Feeder and Stacking Unit for high speed notching machines. New V & O Straight Side Press . . . **BOOTH 509**



NOTCHING MACHINE . . .



STRAIGHT SIDE . . .



DIEING MACHINE . . .

# of Henry & Wright Yours to Use in for Your Needs

**EMHART MFG. CO.**

PRESS DIVISIONS

HENRY & WRIGHT
HARTFORD, CONNECTICUT

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*Presses and methods that automatically reduce costs*



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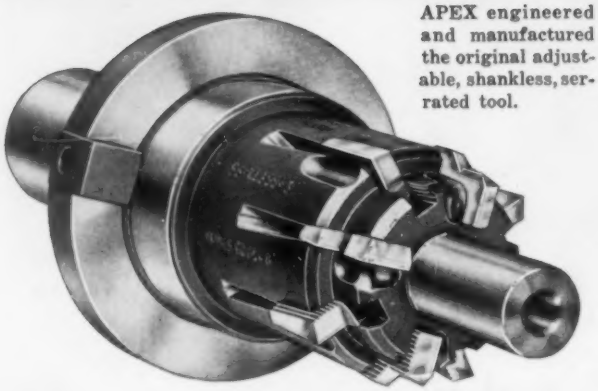
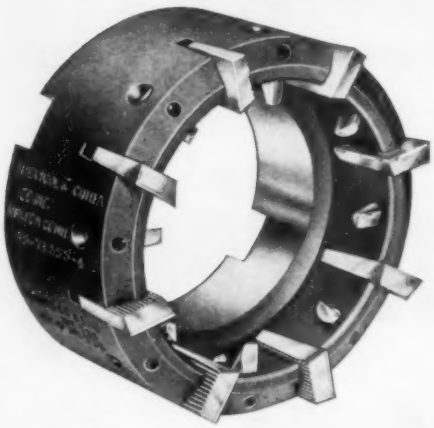
# PRODUCTION TOOLS by APEX



APEX engineered and manufactured the original adjustable, shankless, serrated tool.

VISIT APEX BOOTH 174
A.S.T.E.
INDUSTRIAL EXPOSITION
*Chicago, March 19-23*



## Combination Multiple Cutter

Performs 8 operations to size: faces 3 surfaces, bores 2 diameters, hollow-mills and chamfers 2 edges. With inserted blades, adjustment for size is built in. Serrations provide minimum adjustment — and with ease, as no locks or pins are needed with this tapered blade.

Serrated, inserted blades of DROP FORGED H.S. or super cobalt steel. Carbide tips to your specification. Bodies drop forged and heat treated. Send for catalog. Service engineers will gladly co-operate with you on tooling.

THE APEX TOOL & CUTTER CO., SHELTON 16, CONN.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-440-1

# *Geneva* Dial Indicators for Precision Production

Test Sets for Machinists, Tool Makers and Inspectors

.001", .0005", .0001" Dial Indicators with Exclusive lever action

**Since 1896, Geneva Precision Instruments have been used for precise checking.**

Complete line includes:

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Dial Indicators with Threaded Stem
Regular Test Sets — 4" and 8" Base
with solid, adjustable & "T" slot uprights
Production Bench Gage — Dial Snap Gages
Test Set with Magnetic Base

*16-page illustrated Catalog 106 sent FREE on request.*

**CHICAGO DIAL INDICATOR CO.**

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See our Exhibit, Booth 1030 A&TE Exposition, Amphitheater, Chicago, March 19-23
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# SEE THE VERSATILE BARKER

$2950.00 AS SHOWN

Bench Type **MILL** OPERATING at the A.S.T.E. SHOW in CHICAGO

for the Production Milling of Small Parts by Unskilled Help

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You'll Also See *BRAND NEW DEVELOPMENTS* in the POPULAR BARKER LINE

Screw Feeds Optional at Extra Cost

*Write for Complete Details*

**BARKER ENGINEERING COMPANY**

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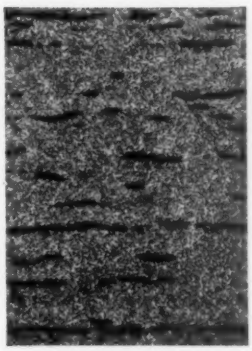
# How to make gages and dies that last 3 times longer and make them faster

CHANCES are you can make your gages or dies last three times longer by making them from Graph-Mo® tool steel. Users report that Graph-Mo tool steel outwears other tool steels on an average of 3 to 1. A combination of free graphite and diamond-hard carbides in its structure makes this possible.



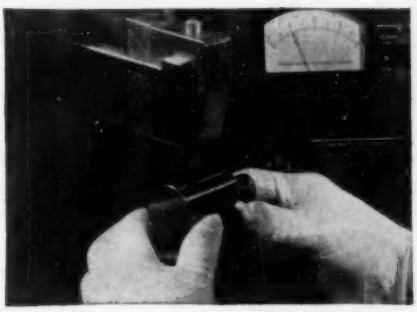
100 times magnification of Graph-Mo showing free-graphite and diamond-hard carbides.

And you can make gages and dies *faster,* too, with Graph-Mo. Constant Pressure Machinability tests show that Graph-Mo steel machines 30% faster than other tool steels.

The gages and dies you make from Graph-Mo steel will not only give you the important benefits of wearability and machinability, but also they'll stay accurate longer. Tests prove the stability of Graph-Mo steel. For example, a typical master plug gage made of Graph-Mo steel showed less than 10 millionths of an inch variation from its original dimensions after 12 years of use. It's the most stable gage steel ever made.

Because Graph-Mo steel has a minimum tendency to pick up, scuff or gall, it makes for a much better surface on your dies and gages. Graphite particles in Graph-Mo steel act as a "built-in" lubricant. Tests on the Amsler Wear Machine show Graph-Mo steel has twice the resistance to galling compared with ordinary tool steels.

So to get the most wearable, machinable and stable tool steel there is, get Graph-Mo. You can readily tell it by its "graphitic look"—the tiny, scattered parallel marks just barely visible on a piece of polished Graph-Mo. Insist on this "trade-mark" that's part of the steel

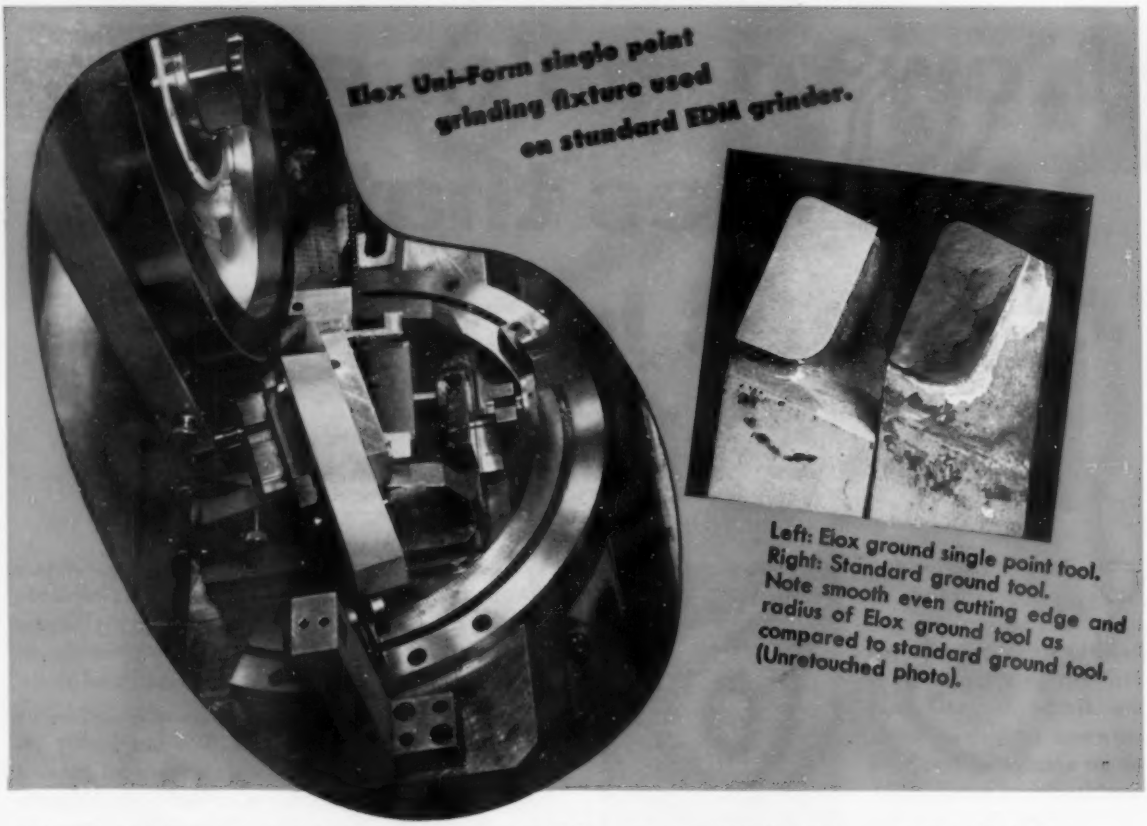


Graph-Mo steel plug gage tested for 12 years to prove stability.

itself the next time you buy gages, dies or tool steel. For more information, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING


Elox Uni-Form single point
grinding fixture used
on standard EDM grinder.
Left: Elox ground single point tool.
Right: Standard ground tool.
Note smooth even cutting edge and
radius of Elox ground tool as
compared to standard ground tool.
(Unretouched photo).

**grind 2 faces and radius on 1/2" x 1" carbide insert in 3-1/2 minutes automatically . . . repetitively . . . without variation . . . without heat checks . . . without manual assistance!**

**elox*** corporation of michigan

**1837 Stevenson Hwy.**
**Royal Oak 3, Mich.**

**DEMONSTRATION CENTERS:**
Plant—Royal Oak, Mich.

45 Broad Ave., Palisades Park, N.J.
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Elox Electrical Discharge Machining of single point tools is an electronically controlled push button operation. Variable human elements are completely eliminated, guaranteeing every tool sharpened identical as to finish, radius.
Grinding is done with a brass wheel to any pre-determined specifications. Every tool repetitively uniform!

**Advantages of Elox Uni-Form Tool Grinding:**

- **Permits use of standard blanks**
- **Every tool is identical as to radius, finish**
- **Increased tool life**
- **More regrinds per tool**
- **Eliminates diamond wheels**
- **Carbide and tool shank are ground simultaneously**
- **Averages 40% labor savings**

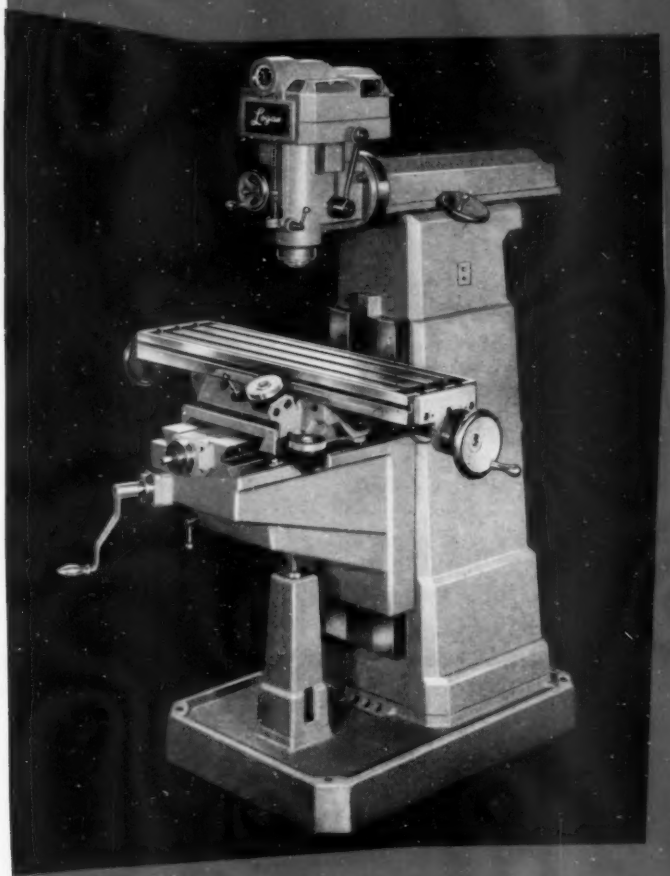
See Elox Uni-Form Single Point Tool Fixture in operation at Elox Demonstration Centers.

**Elox Electron Drill equipment for removing broken taps, drills, etc., from $495 to $3450.**

*T.M. Reg.

# THE Logan MILL

*is more than NEW... it's years ahead!*



Your Logan Dealer invites your inspection of a really new idea in Vertical Milling Machines. The most up-to-date principles of machine tool engineering are incorporated in the Logan Mill's advanced design and rugged construction. The motor in the base, for example, eliminates transmission of shock to the spindle. The large, heavily constructed ram provides 16" of clamping surface. The Variable Speed Drive offers infinite speed range of 80 to 570 rpm in low gear, and, by movement of a lever, a high gear range of 570 to 3800 rpm. The heavy, precision ground quill has a 5" travel, and the spindle revolves on precision ground, pre-loaded ball bearings. The operator has instant selection of the proper feed and speed with *no belt changes*. All these features and advantages can be purchased in the same price range as mills of similar capacity on the market.

**BRIEF SPECIFICATIONS**

SPINDLE SPEEDS . . . Infinite, 80 to 570 rpm in low gear, and 570 to 3800 rpm in high gear . . . infinite quill feed, 0 to .008" per revolution . . . 5" stroke . . . 360° head rotation . . . TABLE, 36" x 9" . . . three 11/16" tee slots . . . DRIVE, V-belt . . . 1½ HP, 3-Phase Motor

*For full details and specifications see your Logan dealer, or write for Bulletin*

**LOGAN ENGINEERING CO.**

4901 West Lawrence Avenue, Chicago 30, Illinois

# FIELD REPORT: NO. 90

## WHICH DIE STEEL WOULD YOU USE HERE to get this punch out of hardening in one piece?

This punch blanks automotive stampings from SAE 1010 strip, .062" thick. It is so unbalanced in design that safety in hardening is vital in the die steel used. Since the punch is shear fitted to the die section before heat treating, accuracy in hardening is equally important. The punch is hardened to Rockwell C-61/62. All the steels tried either broke or changed size excessively.

If the decision were squarely in your lap, which die steel would you be willing to recommend?

Here's how the manufacturer solved the problem, as recorded in a Field Report from our customer: The Carpenter Matched Set Method showed that Carpenter VEGA (Air-Tough) Die Steel had the hardening safety and accuracy plus toughness demanded by the job. The punches are now coming through heat treatment "right on the nose," and production between grinds has jumped from about 10,000 to 50,000 parts. Further, the heat treater says VEGA is the easiest air-hardening steel he has ever worked with.

When the decision is up to you, rely on Carpenter for *dependable* results. For fast attention to your orders, call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor, today. *The Carpenter Steel Co., 154 W. Bern St., Reading, Pa.*

**Your toolroom can use Carpenter Matched Tool and Die Steels to:**

Reduce hardening hazards
Minimize machine downtime
Boost output per grind
Improve product quality

Carpenter STEEL

**Matched Tool and Die Steels**

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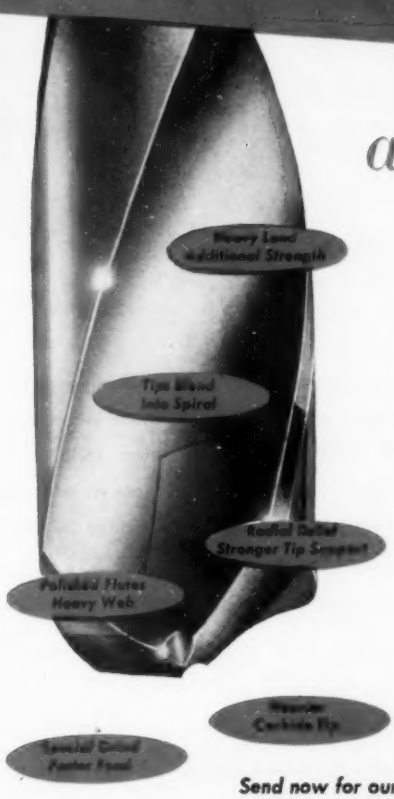


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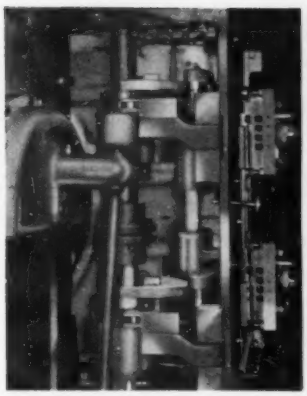

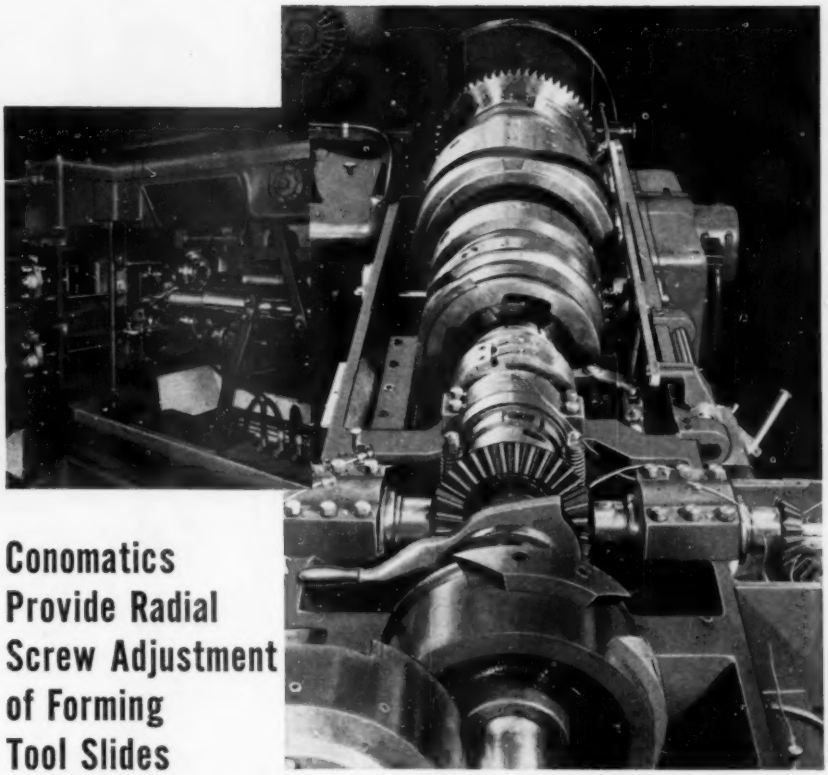

## Conomatics Provide Radial Screw Adjustment of Forming Tool Slides

- Models 2⅝" LA, 3½" AD, 5" KL, and 5¼" KR Conomatic Four Spindle Bar Machines are equipped with a number of quick job-change features. One of these is the all-position end attachment drive for the mounting of endworking opposed spindles in all positions, with independent feed to as many as three opposed spindles on a single setup.

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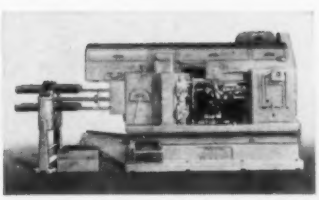
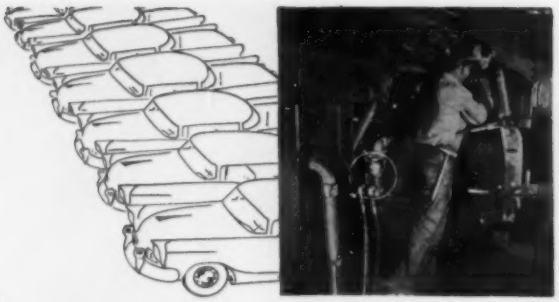
All Conomatic quick changeover models are equipped with dial adjustment of the working stroke of all tool carrying slides. Besides the Four Spindle machines there are three quick change Six Spindle models in 9/16", 1" and 1⅝" sizes.
Write, wire, or phone for literature.

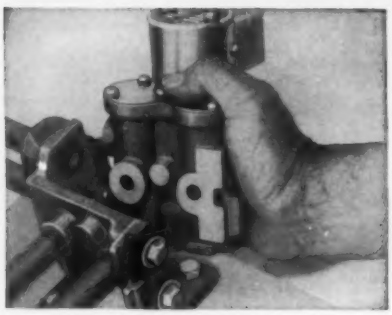


# Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.



# THEY BUILD ANOTHER CAR IN THE TIME SAVED...



How much production do *you* lose when a valve breaks down? In less than a minute you can take a Crescent® sub-base mounted four-way air valve from the line and be back in service with a new one.

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If you are using air valves in your plant and they are not Crescent® valves, you are paying too much for them—in lost production.

Write for the informative free literature on standard and sub-base mounted four-way air valves (to 150 P.S.I.). Also available with explosion-proof solenoid housing.

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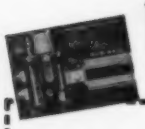

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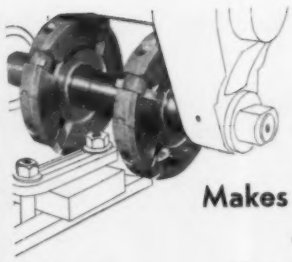

Straddle milling with New-Field cutter

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**Makes 4-6 cuts in one operation!**

**Uses standard bits!**

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No need now for special cutters for many types of milling if you use the New-Field Universal Fly Cutter. One New-Field cutter using any type of high speed steel or carbide bits makes multiple cuts in one operation. Standard bits are easily reground or replaced when needed for other work. Down time is cut to minimum.

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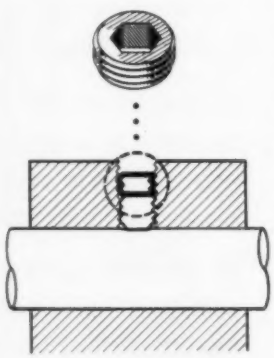
## STOP SET SCREW SLIPS!

***...see how at Booth 906, ASTE Show***



Excessive speed and vibration can't shake loose a socket set screw when the Mac-it Hollow Lock Screw is on the job! Why? Because it's tightened *against the set screw* to produce "internal lock nut" action.

This Mac-it Hollow Lock Screw is a tough customer! It's made of high-grade alloy steel—carefully heat treated throughout for a fine, uniform grain structure. Accurate socket and threads hold their shape even after thousands of adjustments.

Because the hex socket goes all the way through, assembly is quick and easy: a set screw and lock screw may be tightened separately or together using the same key—and the set screw may be re-set without removing the lock screw.

Your local distributor carries complete stocks of Mac-it Hollow Lock Screws in sizes #6 to 1", either N.C. or N.F. threads, Class 3 fit. Ask him for free samples and literature, or write:

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The Finishing Room and Measuring Laboratory, the very heart of our gage plant, are both maintained at a constant standard 68 degree temperature.

Here, highly skilled, unhurried men and women, with a high average experience in this work, are the guardians of our quality. They work under ideal conditions and with the very latest of finishing and inspection equipment.

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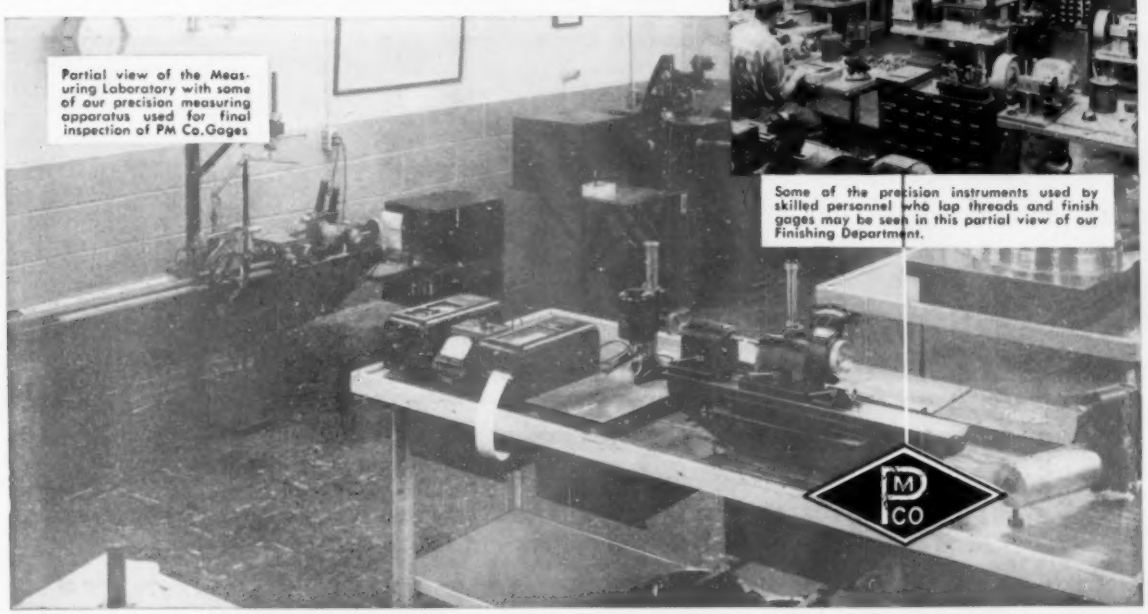
This Universal Measuring Microscope magnifies 30 times and measures to half .0001"; permits easy estimation to .00001" on lead, angle, and thread depth.

Some of the precision instruments used by skilled personnel who lap threads and finish gages may be seen in this partial view of our Finishing Department.



Partial view of the Measuring Laboratory with some of our precision measuring apparatus used for final inspection of PM Co. Gages

FREE to you from

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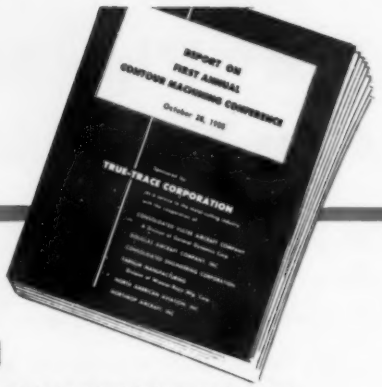


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. . . written by leading tool engineers from Douglas, Convair, Farnham, North American, Consolidated Engineering, Northrop, True-Trace. Gives you up-to-the-minute techniques and case-history applications of contour machining — the new development in faster metal cutting of difficult-to-machine designs.

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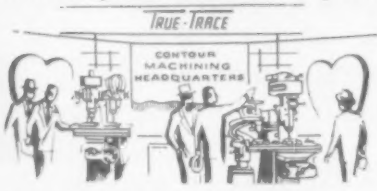


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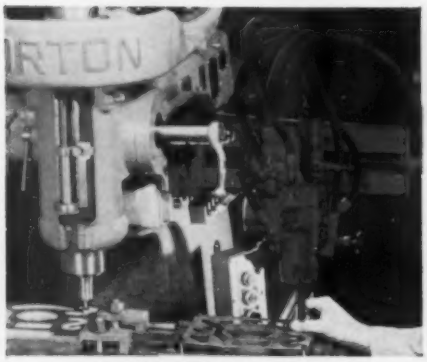
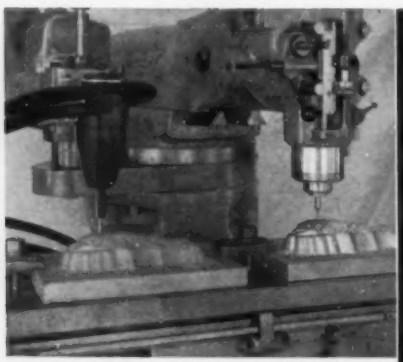


True-Trace Model 3D, Gorton Model 9J



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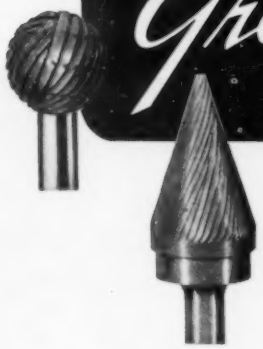

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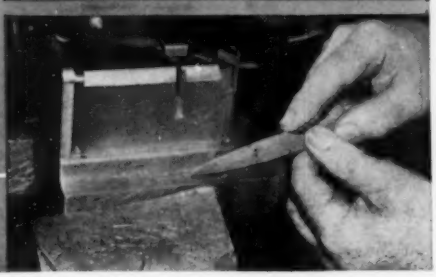

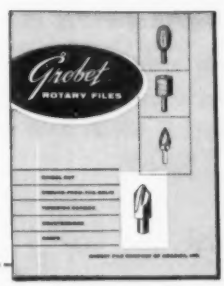


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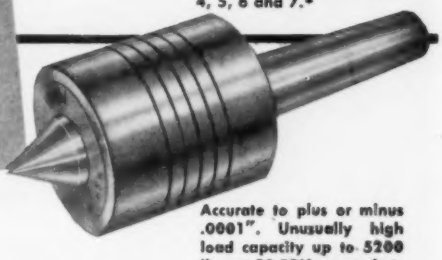

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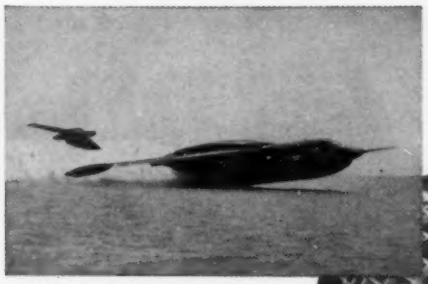

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**That's why *MARTIN* depends upon the quality performance of**

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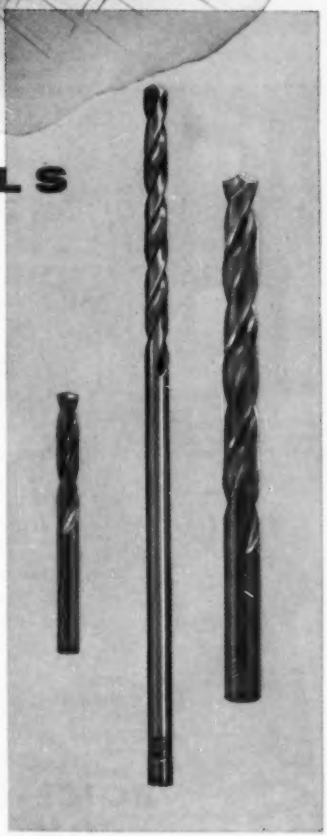

By producing thousands upon thousands of clean, concentric holes without burrs — and more holes for every dollar, NEW YORK Twist Drills play an important part in the construction of the sleek new XP6M-1 SeaMaster and other Martin aircraft. Their own performance tests prove NEW YORK Drills are straight and true, with accurate points and extra smooth flutes.

We've been a major supplier of twist drills to this famous company for a number of years, now. Among the NEW YORK drills used in the Martin plants are our aircraft extension types, 6″ and 12″, adapter drills, stack drills, drills for stainless steel, 75 ST aluminum and titanium.

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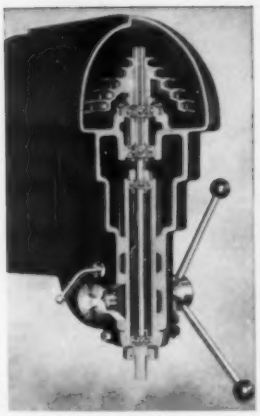
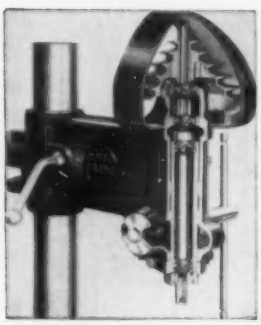


*—Specializes in this versatile tool—makes medium duty and heavy duty lines.*



If you want truly accurate holes or threads; "beef" on spindles, bearings, splines, head and column to take continuous production punishment on jobs you have thought impossible with 15-inch drill presses; minimum down time; capacity for larger holes; and/or sensitivity for small wire drill sizes—you need the Boice-Crane 5/8" Helmet Head! It gives you 25% more capacity—is 5/8", not just the customary 1/2" capacity of other 15" (and 14") machines. 64 high and low speed bench and floor models. 1-2-3-4-6-8 spindles. 5 speeds.

If you want a 15-inch, 1/2-inch drill press in the low price range, check the Boice-Crane Challenger, feature for feature, with others in the same price class. Exclusive two-way aliner-belt tensioner. Perfect alignment and tension instantly released for speed changing without wrenches or tools. 6-tooth splined drive. Every splined-drive part made of steel for quiet running and longer life. Four heavy grease-sealed ball bearings. Massive head and positive, easy, quick acting non-mar quill and column locks. 5 speeds in two ranges.

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**SEE** ***THE NEW STEWART-WARNER MODEL 708 DYNAMIC AND KINETIC ELECTRONIC BALANCER WITH...***

- Diametral range from 1" to 64" on any rotating piece.
- Variable belt speeds from 750 to 3800 ft. per minute on surfaces up to 48" in diameter.
- Remote control in the handle for starting, stopping and speed adjustment.
- Hydraulic brake with convenient move-around foot pedal.
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- 1 lb. to over 5000 lbs. weight capacity.
- Sensitivity greater than .04 in.-oz.
- Numerous other advanced engineering features in Electronic Balancing machines.

**SEE** also the New, Improved Stewart-Warner Model 704 dynamic and kinetic electronic balancer with the new advanced miniature tube electronic unit for smaller profit-making job type balancing.

**AND**...for electronically balancing, dynamically and kinetically, large units where it is impractical to remove the rotor, see the new Stewart-Warner Model 717 PORTABLE demonstrating the new High Intensity Stroboscope for determining speed of rotation of a part to be balanced without any contact with the rotating part.

YES, see these advance-engineered electronic balancers demonstrated in booth 125, sponsored by the Merrill Engineering Laboratories, at the 1956 ASTE Show and see how you too can eliminate bearing destruction, rotating support member fatigue breakdown and many other down-time situations caused by vibration.

**IF** *you will be unable to see these advance-design electronic balancers at the show, write now for your complete Stewart-Warner Model 708 brochure.*

Merrill ENGINEERING LABORATORIES

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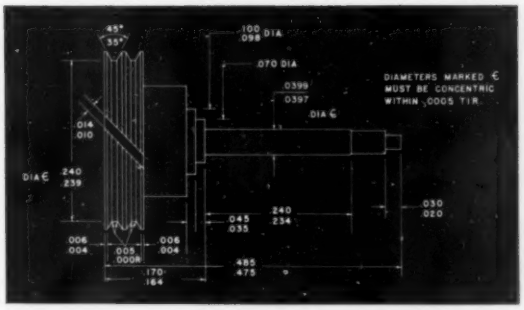
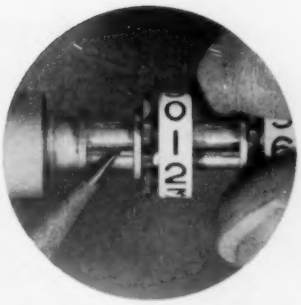
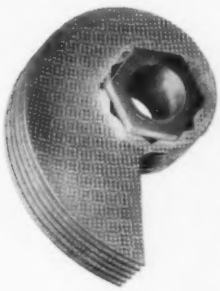



Inspection of incoming precision shafts took 10 to 15 minutes each by mechanical gaging—involved concentricity, diameters, shoulder locations, and other tough-to-measure dimensions to tolerances of .0002". Doing the work on a Kodak Contour Projector cut time to 2 to 3 minutes per shaft.



The problem was to check many small calculating machine parts averaging about 13 critical dimensions for each with shapes mostly complex. With carefully engineered mechanical gages, inspection time averaged 50 seconds each. Optical gaging on a Kodak Contour Projector brought the average down to 12 seconds.



Spacing the parallelism of a special tuning condenser for electronic test equipment had to be held to very close tolerances. "Use of the Kodak Contour Projector," the company reports, "permits economical measurements of parallelism to an accuracy impossible to obtain by other methods."

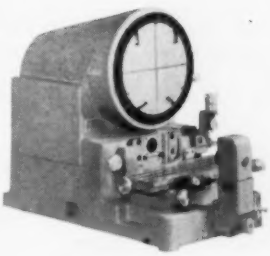
On a flexible rubber-like part, rejects ran as high as 30%. By using a Kodak Contour Projector to measure the parts and then plotting results by statistical quality control methods, production changes were made that resulted in rejects dropping from 30% to less than ¼ of 1%. Optical gaging eliminated distortion of the part while gaging, and proved 4 to 5 times faster than usual methods.

# One instrument inspects these varied parts

Here is another economy optical gaging can provide: switching from one part to a second part requires only a change of chart and fixture. You still use the same basic instrument. And with a Kodak Contour Projector, the variety of parts you can check is almost without limit. Here's why:

1. *Capacity*—Screen size on an optical comparator does not restrict the size of parts you can handle, for multiple-position fixtures allow the handling of parts larger than the screen itself. What's important is the staging area—and Kodak's unique relay lens provides uniform ample clearance regardless of magnification. The distortion-free image lets you measure anywhere on the viewing screen. The choice of lenses, of horizontal or vertical projection, and of surface or shadow illumination gives you the greatest possible flexibility.
2. *Ease of operation*—Kodak Contour Projectors are designed for maximum speed and minimum operator training. The bright screen image reduces fatigue, lets you use the instrument in normal room light. Images are erect and unreversed at all magnifications. Finger-tip controls are within convenient reach of the operator.
3. *Optical stability*—The adjustment-free optical elements on Kodak Contour Projectors eliminate the need for operator adjustments. Rigidly mounted lenses and mirrors maintain alignment and position. Rugged construction withstands rough and heavy use.

Whether you are now using optical gaging or just considering it, you should have a copy of the booklet, "Optical Gaging with Kodak Contour Projectors." It gives complete details on Kodak optical gaging equipment and how it can work for you. Write to *Special Products Sales Division.*



**To see the latest developments in optical gaging, visit Booth 917, ASTE Show, March 19-24, Chicago.**

**EASTMAN KODAK COMPANY,** Rochester 4, N. Y.

## the KODAK CONTOUR PROJECTOR

Kodak
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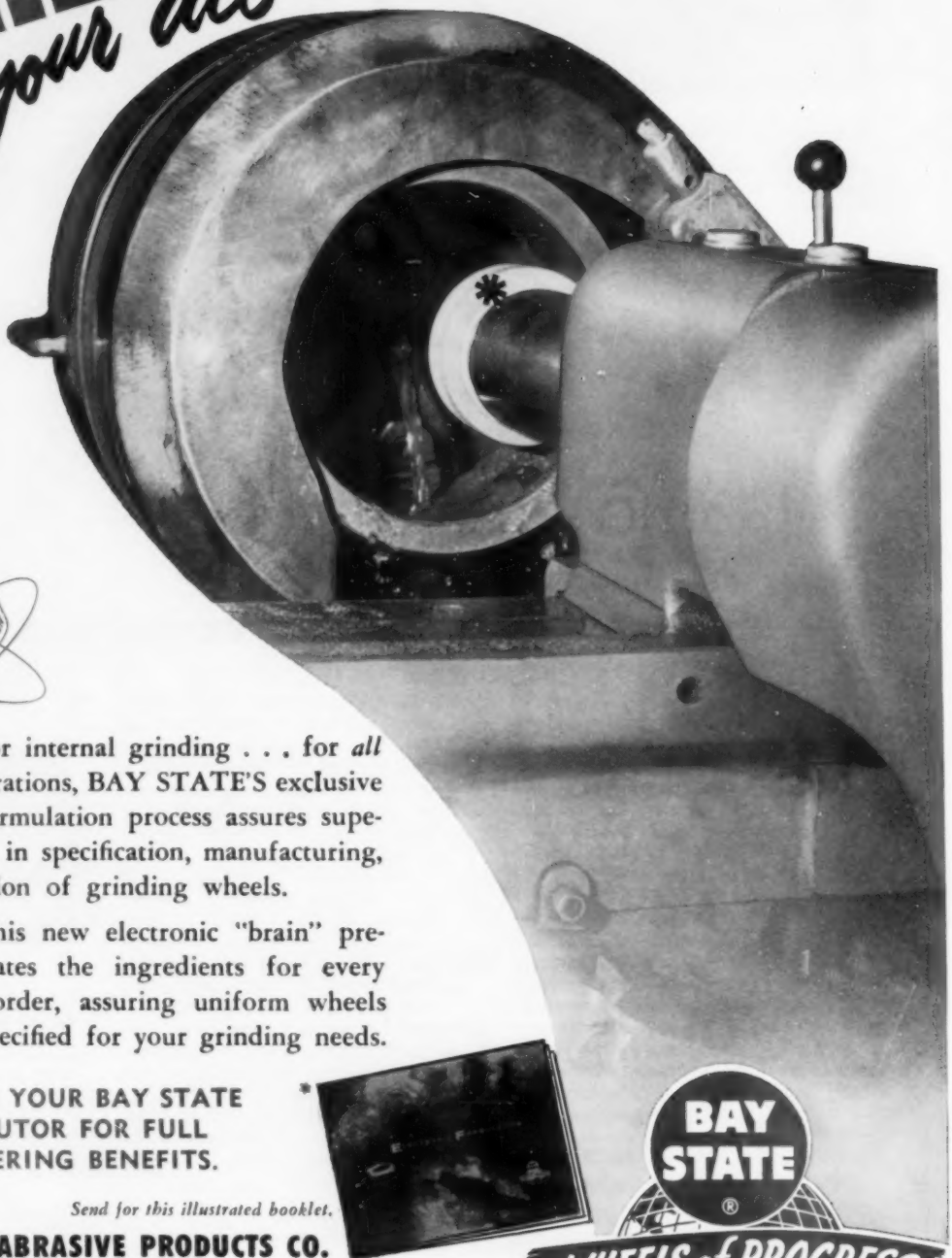
# E.F.* is your ace-in-the hole!



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**The operator handling a conventional rotary gear shaving machine is required to make 7 separate motions for each work part shaved.**

**With semi-automatic loading this is reduced to just 3 operations.**

1. **Place work gear on the pre-locater.**
2. **Press the start button.**
3. **Remove the shaved gear.**

**The rest of the cycle is automatic.**

**Results are:**

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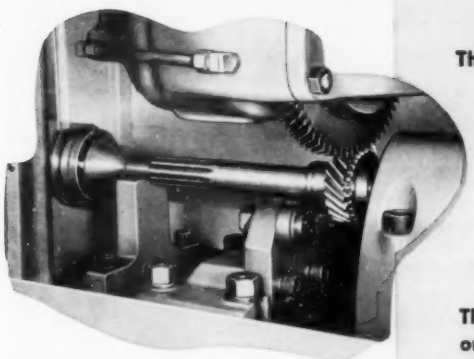
- **Lower machining costs**
- **Less operator fatigue**
- **All the versatility of conventional shaving**
- **Greater safety**
- **Operator has ample time to serve 2 or more machines**

**The approximate work locater and head and tailstock centers or plugs are the only work part changes that are additional to a conventional gear shaver.**

**Red Ring Shaving Machines, Models GCU and GCI may be equipped with this equipment.**



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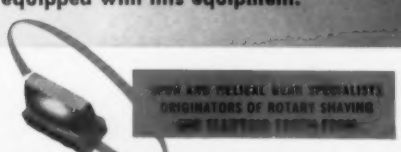

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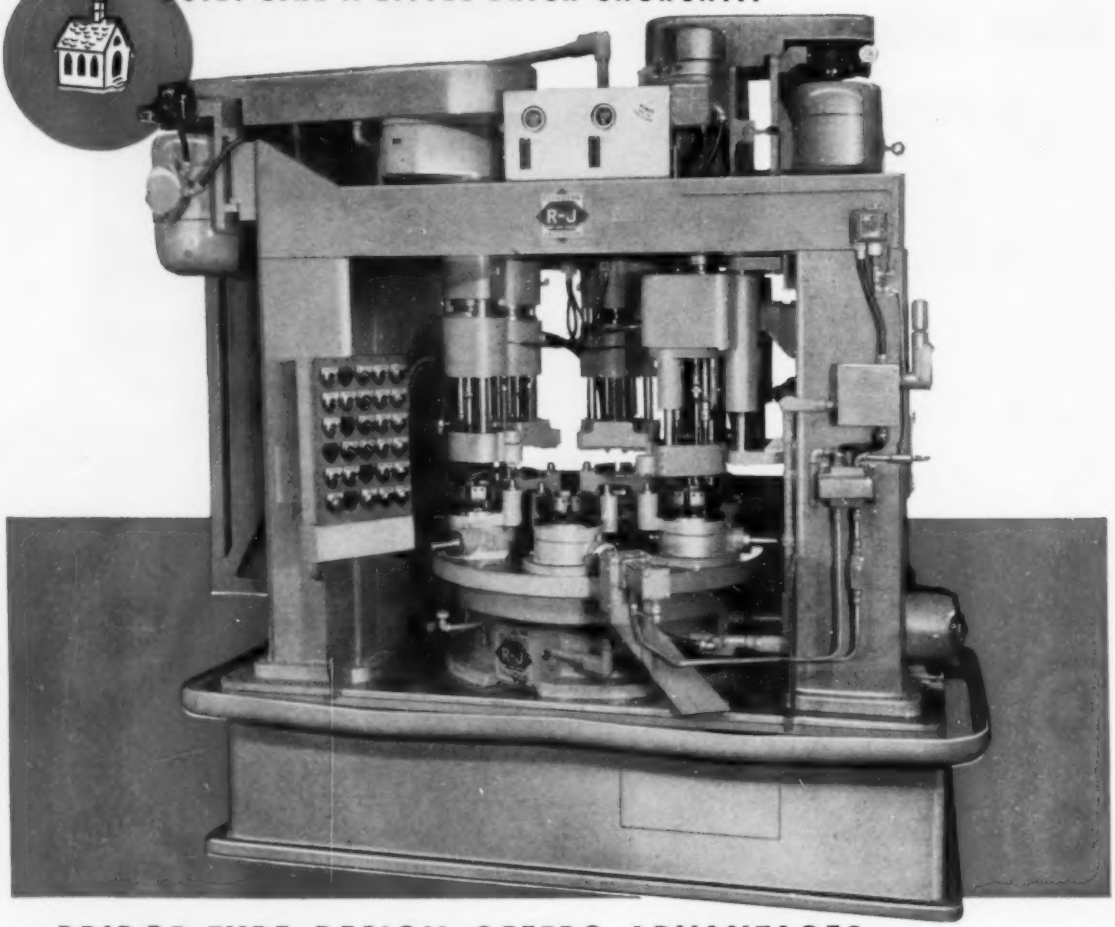


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On a machine of this kind, the powered units are supported on a very strong and rigid bridge-like structure over the index table. In comparison with a center-column arrangement, the bridge permits use of a less-costly standard index unit and provides greater overall stiffness for accurate work. In comparison with a single-column arrangement, the bridge permits use of a variety of separate units in place of all spindles in one unit. The use of separate units, which can be positioned almost anywhere required, provides extreme versatility of arrangement — and easy re-arrangement to accommodate engineering changes or to salvage the machine for adaptation to other work. Separate units also permit independent adjustments of feeds and speeds as desired. ALL-MECHANICAL Rehnberg-Jacobson Drill, Tap, and Index Units combine to form a production machine that is easy to operate, easy to service, and easy to understand.

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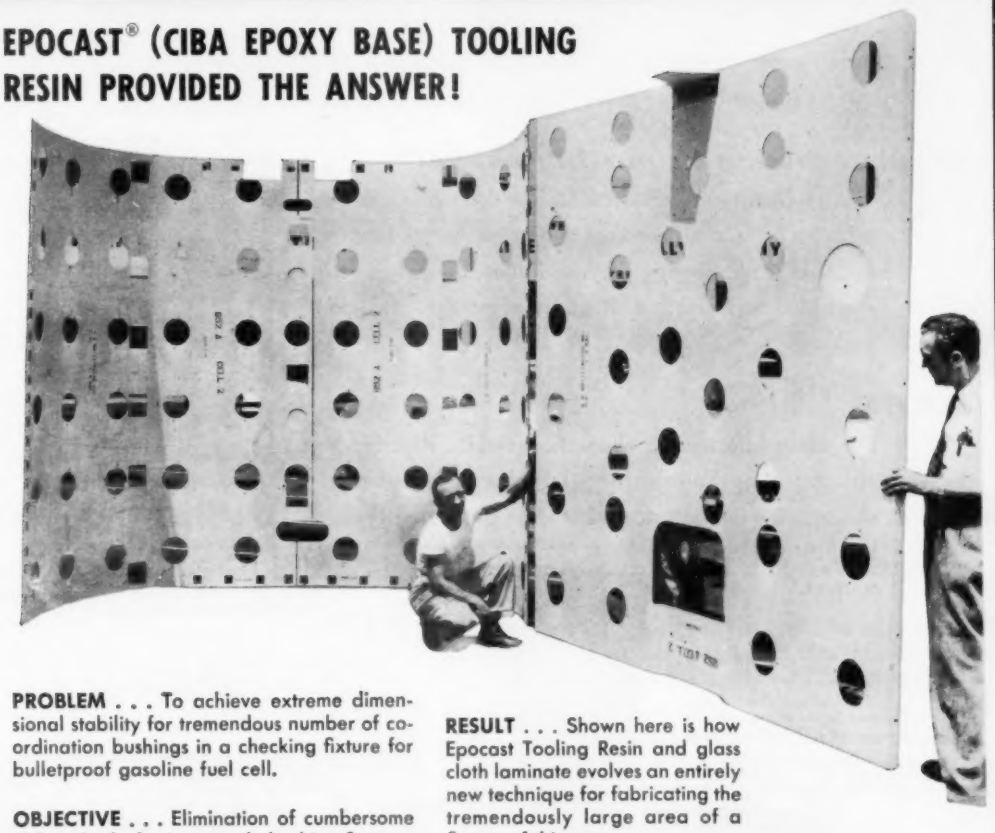
in the making with C I B A Plastics"

**EPOCAST® (CIBA EPOXY BASE) TOOLING RESIN PROVIDED THE ANSWER!**



**PROBLEM . . .** To achieve extreme dimensional stability for tremendous number of coordination bushings in a checking fixture for bulletproof gasoline fuel cell.

**OBJECTIVE . . .** Elimination of cumbersome old method of using wood checking fixtures.

**RESULT . . .** Shown here is how Epocast Tooling Resin and glass cloth laminate evolves an entirely new technique for fabricating the tremendously large area of a fixture of this type.

*Epocast Resins, the key to the solution of the foregoing tooling problem, are the products of Furane Plastics, Los Angeles, California. For further information, send coupon below.*

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***It saves money in paint shops!***

Oakite Rustripper is an alkaline material that strips paint, pigment residues and phosphate coatings from steel at the same time that it removes rust and oil.

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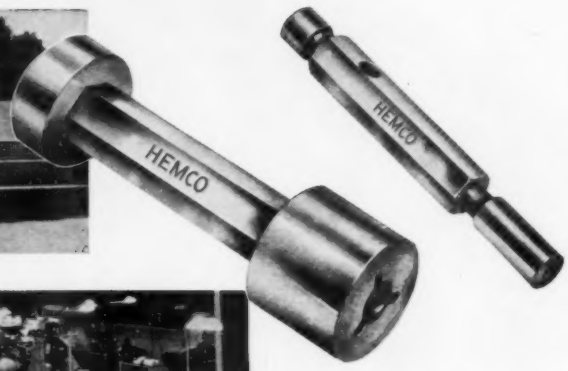


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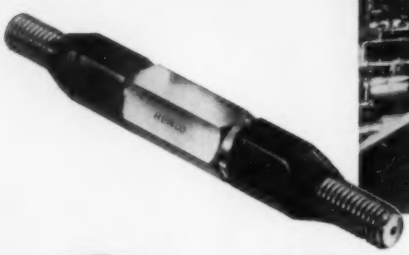

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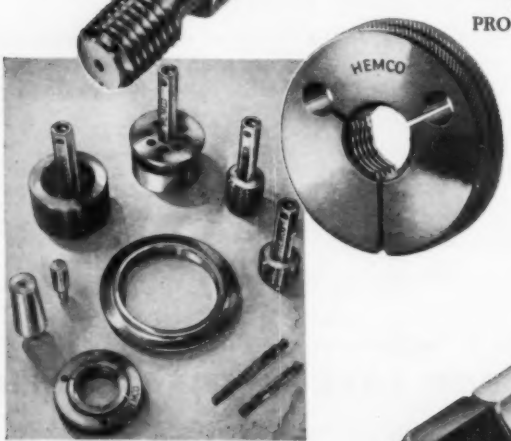


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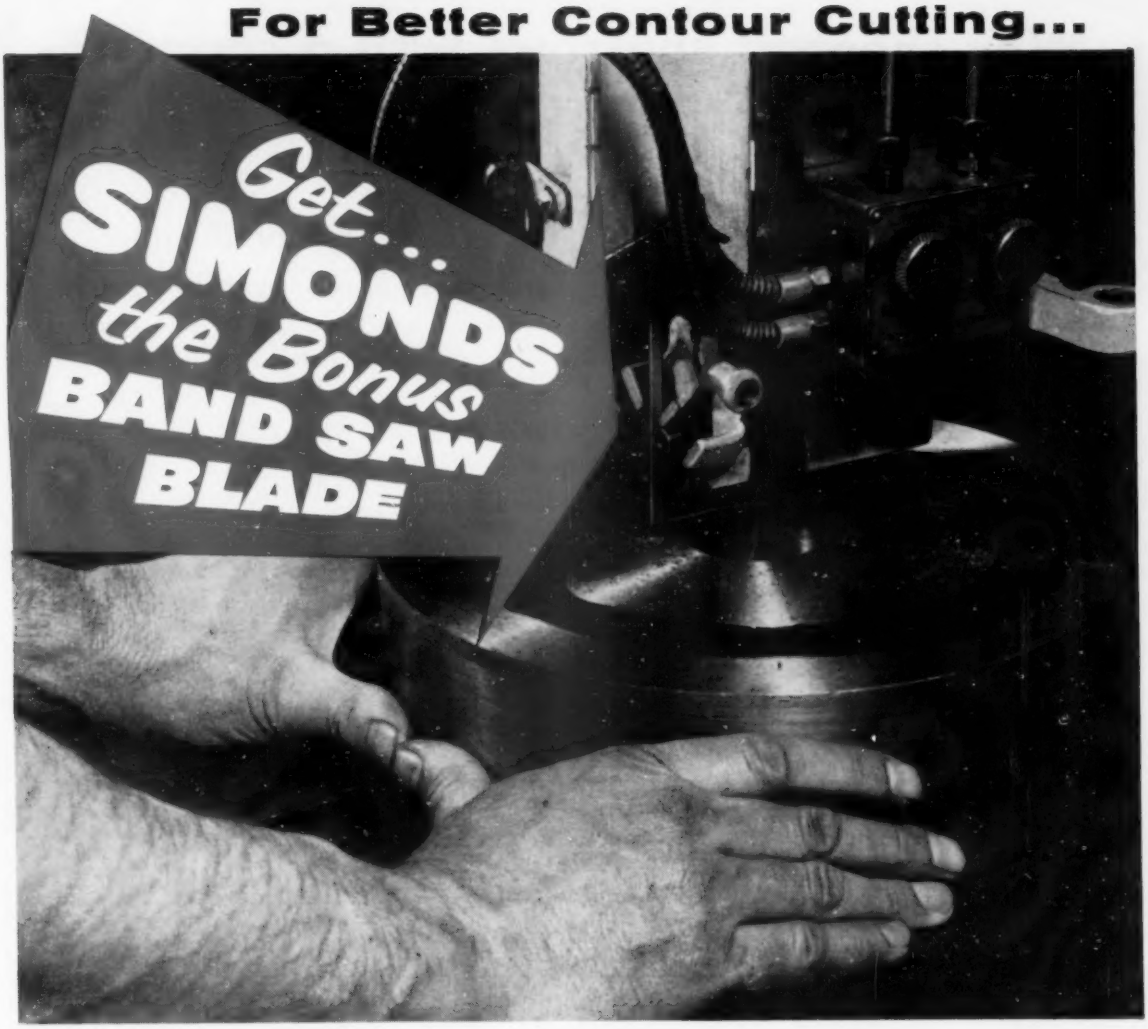


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Made of extra tough, wear-resistant alloy steel, Simonds "Bonus" Bands have sharp, perfectly formed teeth — set with absolute evenness on both sides of the blade. Hardened along the tooth edge only by controlled heat treatment, they combine maximum cut-ability with flexibility and resistance to breakage, provide the ultimate in trouble-free service.

All standard widths and tooth spacings are furnished in 100′ and 250′ coils or welded to specified length. Ask your local Simonds Industrial Supply Distributor for more information on the complete line of Simonds "Bonus" Band Saws.

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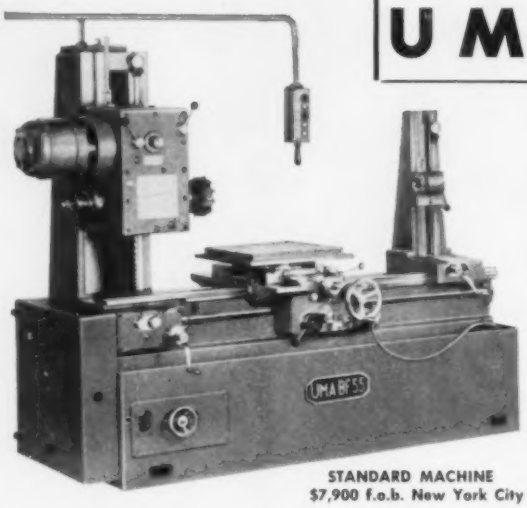
*Heller Tool Co., Newcomerstown, Ohio*
*Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada*

# Why shoot at sparrows with a cannon?

## U M A Boring Mill

*for economical production of ordinary size machine parts*




STANDARD MACHINE
$7,900 f.o.b. New York City

Free your large boring mills for the bigger jobs. The high precision UMA is built with great rigidity to take care of all ordinary jig boring and milling operations in one set-up.

SPECIFICATIONS

| | |
|---|---|
| Boring capacity | 2⅛" |
| Vertical travel over table | 18" |
| Boring depth | 30" |
| Cross travel | 16" |
| Table size | 18"x22½" |
| Spindle to tailstock, max. | 48" |
| Spindle speeds | 50-2000 RPM |

All feeds infinitely variable.
Rapid table travel in all directions.
Remote control from overhead pendant.
Standard equipment includes built-in rotary table.

**See the UMA Boring Mill at the Chicago ASTE Show, Booth 707**

Sold and serviced by

**COLUMBIA INTERNATIONAL CORPORATION**

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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-468-1

# SPECIALISTS IN CLAMPING DEVICES

*We Can Fill Your Needs on Any Clamping Problem*

NEW TRIPLE-E

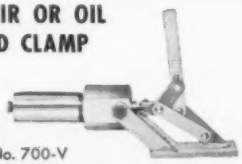
**PORTABLE CLAMPS**

**Greater grip; no marring of surface.**

A portable toggle action clamp with generous throat depth. Used on smooth round or irregular surfaces. Spindle and anvil may be reversed. Long handles cannot interfere with toggle action. Furnished with or without rubber tips or spindle and anvil. Jaw capacities 1" and 1¾".

**TRIPLE-E AIR OR OIL OPERATED CLAMP**

MODEL No. 700



Vertical Base No. 700-V . . . Horizontal Base No. 700-H. Ideal for automation . . . Air or oil power plus fast action . . . Sturdy construction . . . Long life operation . . . Cylinder may be purchased without clamp . . . Off-shelf delivery. 3" stroke, 1½" bore cylinder, 150 P.S.I. Oil housing—Bronze, Hard chrome finish (Piston Rod).

**THAYER TOGGLE CLAMPS**

Rugged, for Heavy-duty work. Hardened steel serrated bushings at pivot points. Hold down arms and handle made of ¾", 1" and 1¼" square solid steel. Holding pressure up to 6000 lbs.

**MERRIMAN HEX-LOX PRESSURE UNITS**

Simple to operate. Push in by hand pressure, turn right and tighten by thread pressure. Use on any thickness of material Vibration will not unlock the Unit. Pressure screw is always in proper position. 3 lengths: 6", 8" and 10".

***Ask for Literature***

*Also*

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MERRIMAN BUSHINGS

SINE ADJUSTABLE DRILL GUIDES

**LA-KO TOGGLE CLAMPS**

Made from stampings; sturdy, withstands hard usage. Patented Hardened steel bushings at pivot points assure long wear. Holding pressure up to 650 lbs.

**E & E ENGINEERING, INC.** EEE **15023 HARPER AVENUE DETROIT 24, MICHIGAN**

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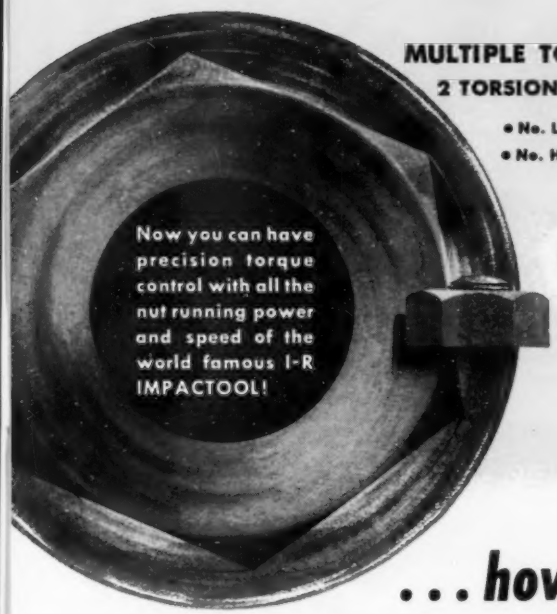
**Revolutionary AIRengineering Development by Ingersoll-Rand . . .**

**TORSION BAR**

# *Torque control*

## IMPACTOOLS




**MULTIPLE TORQUE SETTINGS**

**2 TORSION BARS AVAILABLE:**

- **No. L735. Max. torque 60 ft. lbs.**
- **No. H735. Max. torque 90 ft. lbs.**

**Size 5040T***

***For torques up to 550 ft. lbs., a Size 5340T *Torque Control* Impactool is available**

## . . . *how can YOU use these* ADVANTAGES ON NUT RUNNING JOBS *where prescribed torques must be met?*

- **POSITIVE TORQUE CONTROL**—a revolutionary use of a rugged steel torsion bar for precision control of torque—combined with the power and speed of the Impactool.
- **SIMPLE TORQUE SETTING**—torsion bar adjusting sleeve is clearly calibrated for changing torque with easy-to-use torque jig.
- **TORQUE SETTING REMAINS CONSTANT**—for any nut running condition until the adjustment is changed.
- **ELIMINATES "OVER-TORQUE"**—impact mechanism rebounds instantly when preset torque is reached, tripping a foolproof rubber faced shutoff valve.
- **LOW MAINTENANCE**—combines many of the proven features of Ingersoll-Rand Impactools, with their enviable record of dependable performance and low maintenance.
- **REVERSIBLE**—full power in either direction.
- **NO CLUTCH**—to wear, slip or require adjustments.

**Torque can be quickly and easily set, using the jig as shown above. The torsion bar automatically shuts off the tool when the nut running resistance becomes equal to the stress in the preset torsion bar.**

Ask your Ingersoll-Rand AIRengineer for a demonstration now . . . or write direct for more information on this amazing development.

# Ingersoll-Rand

**Impactool Division**
**11 Broadway, New York 4, N.Y.**

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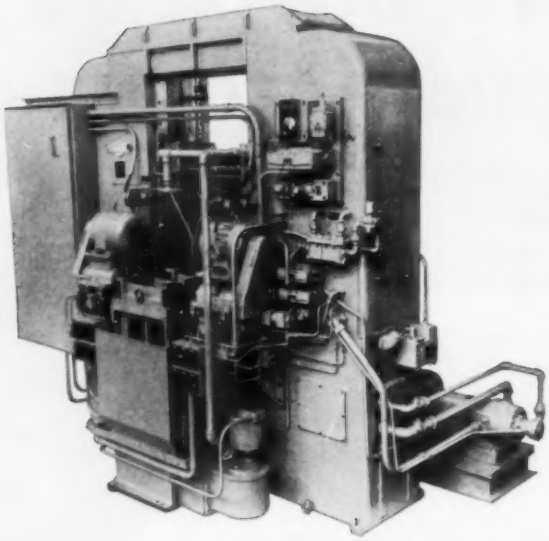
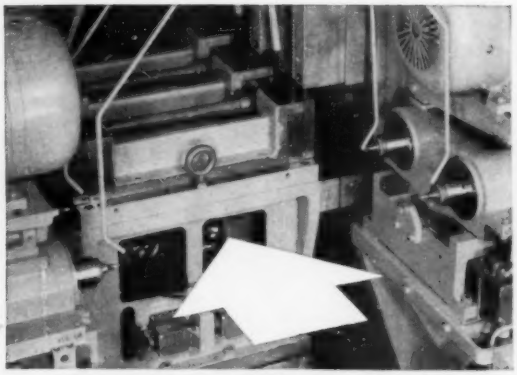
ANOTHER *American* FIRST

# COMBINED BROACHING and CENTER DRILLING

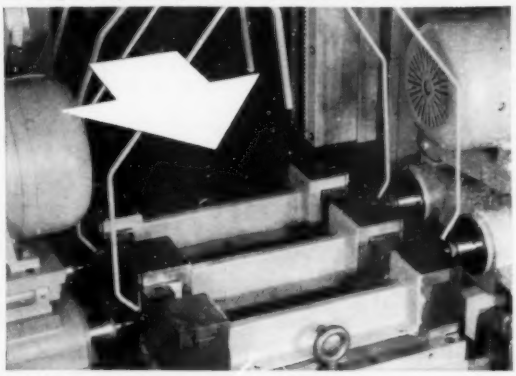
**PRODUCTION:**
**OVER 300 TRANSMISSION SHAFTS PER HOUR**





Two parts are automatically clamped and shuttled into broaching position by hydraulic slide. Surface broach sections mounted on the two rams move down to broach approximately ¼" of stock from each end of forged parts.

While the rams return, the slide moves back, positioning parts for center drilling of both ends. Drills move in, after which parts are automatically unclamped. Complete cycle is push button controlled.



Here, in one machine, American has combined two operations — broaching and center drilling of both ends of automotive main transmission shaft forgings, two at a time.

Two standard vertical hydraulic broaching machines were adapted to a common center table that is equipped with a hydraulically operated slide and two-station clamping fixture. Parts are automatically clamped in place, shuttled into the broaching and drilling positions, and unclamped — with the entire cycle being interlocked with electrical controls.

American engineers will be happy to recommend the broaching equipment either special or standard, that is best for your operation. Send sample part or detailed drawing. Your requirements will get prompt attention.

*Write for Catalog No. 450, American's revised informative manual of broaching machines, broaches and fixtures.*

AMERICAN *American* BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

SUNDSTRAND

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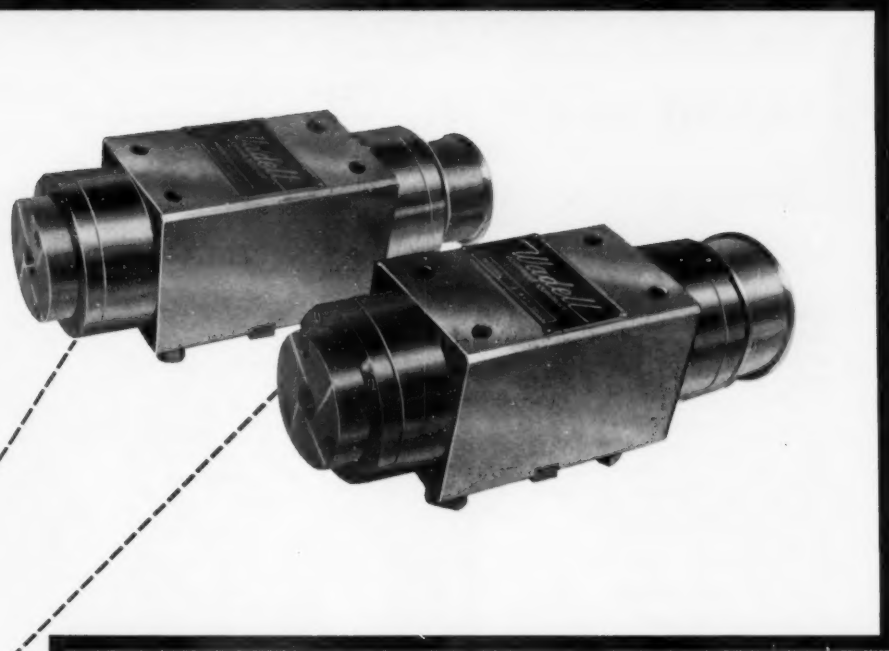
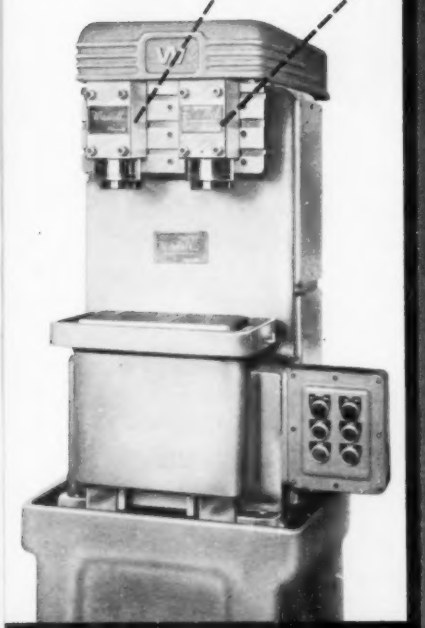
# WADELL BORING MACHINES FEATURE QUALITY BORING SPINDLES





Model VBM - Vertical precision boring machine

Wadell Vertical Precision Boring Machines feature boring spindles of unsurpassed **QUALITY.** More than a quarter century of manufacturing experience has enabled Wadell to develop technique, facilities and skill which provides this quality to the user.

Advanced methods plus skilled craftsmen, expert hand fitting and assembly adds up to optimum spindle accuracy and lower cost. Spindle design and selection of bearings is afforded equal consideration.

Whatever your boring machine requirements Wadell can furnish ball or roller bearing spindles, you can be confident will perform to your complete satisfaction.

The Wadell, model VBM, vertical precision boring machine, rotary positioning tables and quality boring spindles provide really high production at very low comparable cost.

Wadell is prepared to furnish machines completely tooled and ready to operate in your plant. Forward your parts prints to Wadell and get complete **PRODUCTION PACKAGE** cost.

*write for further information*

**WADELL EQUIPMENT CO.**

119 SOUTH AVE., GARWOOD, N. J.

**SEE THE VBM IN ACTION...Booth No. 135...ASTE Industrial Exposition**

# dixi 60

## horizontal optical jig borer

*with 5 optical microscopes*

**DESIGNED AND BUILT FOR:**

**VERSATILITY**
*Optical settings for operations in all planes and compound angles . . . Equally suitable for tooling, short-run or production work . . .*

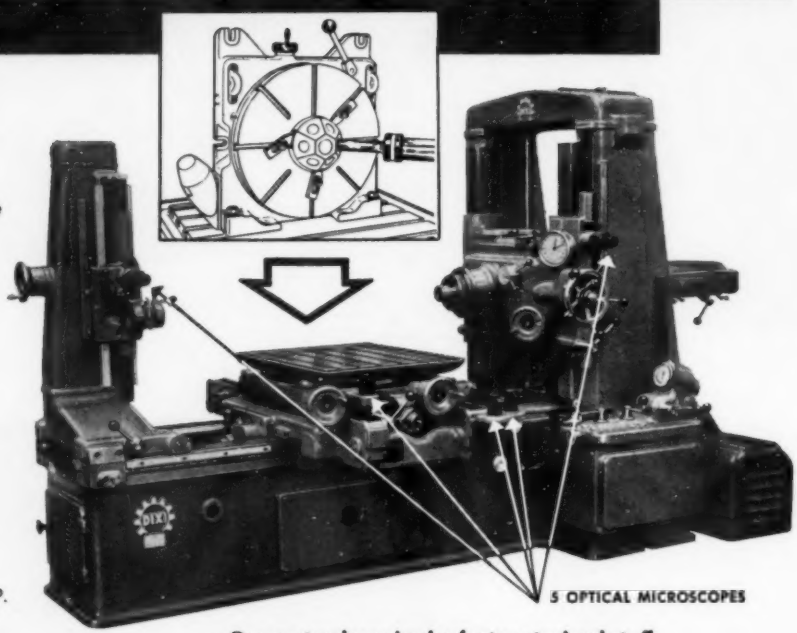
**ACCURACY**
*Overall accuracy of .0002"*

A precision machine for *JIGLESS* boring, facing, milling, and drilling work, in all planes. Built-in 360° optical rotary table, 28¾" x 32⅝". All spindle and table settings by optical microscopes. Infinitely variable hydraulic feeds. Mechanical spindle feeds with automatic depth stop. #40 taper spindle-speeds infinitely variable to 1400 R.P.M. Special features eliminate effect of spindle overhang on accuracy.

**DIXI 450 PRECISION OPTICAL CIRCULAR DIVIDING TABLE**

*Direct readings of 1 sec.*

(See insert picture above) rigidly mounted (not tilting) on built-in rotary table permits holding close tolerance relations between bores in all planes, including bores at compound angles. ALL IN ONE SET-UP. All sides of the work piece except the mounting face machined in one set-up.

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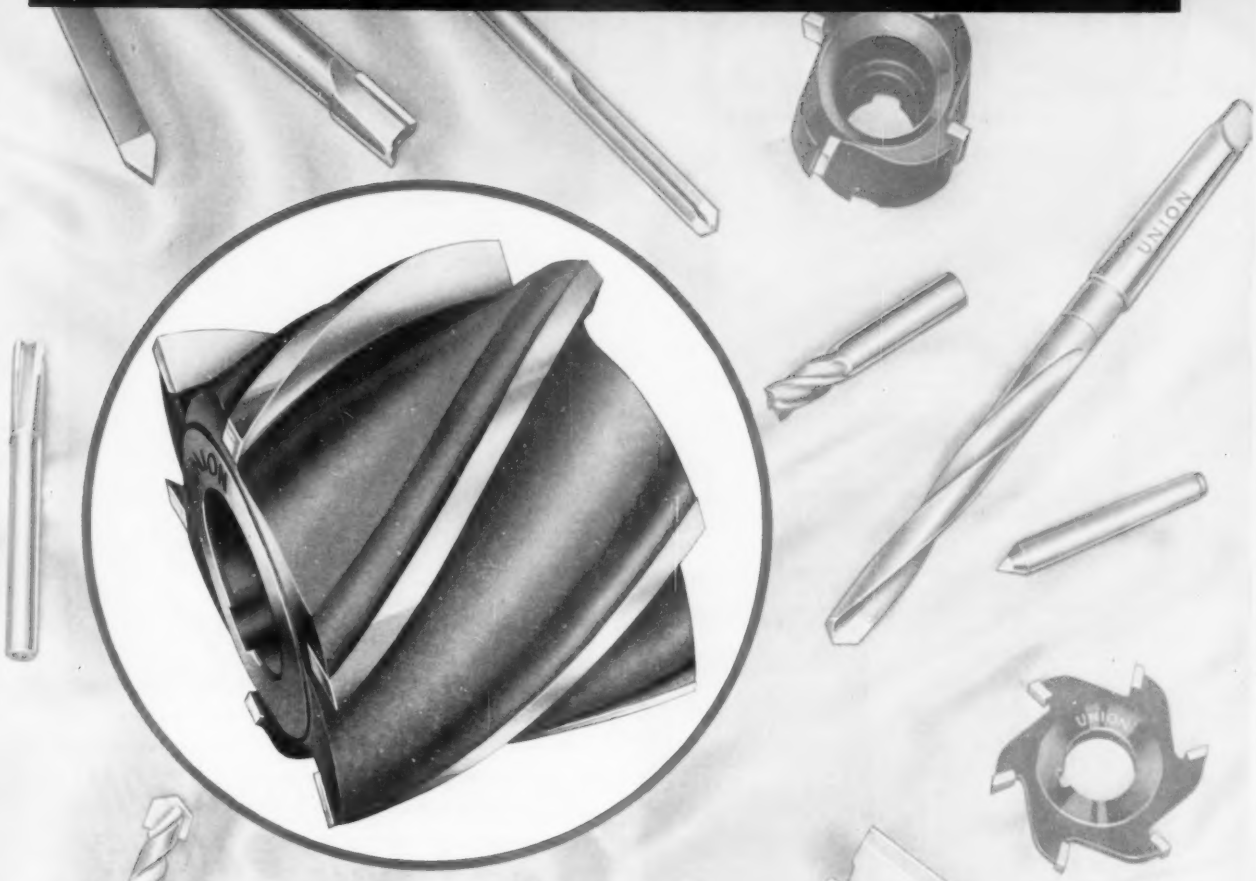

*Write on your company letterhead for our new Carbide Tool Catalog. Address Dept. E*

# UNION

When the work calls for *carbide* cutting tools — tipped or solid — you can count on Union to supply them. The right grade of carbide will have been carefully selected to serve your exact purpose on the material you wish to machine.

Specify Quality Union Tools for *all* your cutting needs.

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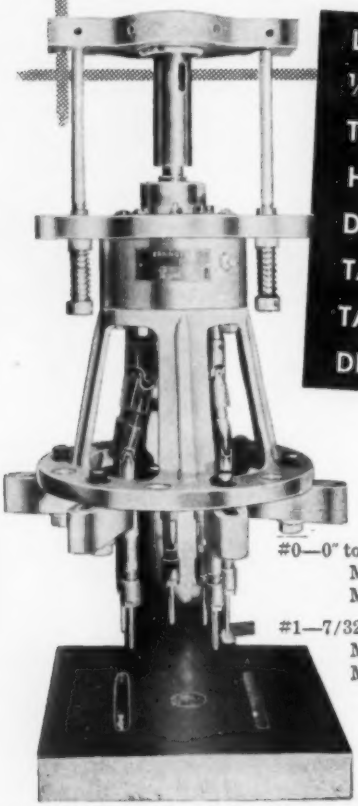
**UNIVERSAL JOINT ADJUSTABLE TAPPING & DRILLING HEAD**

Here's another hi-speed production tool from Errington. This dependable tool is adjustable to any pattern of holes . . . is available with 4 or 6 spindles. Positive clutch drive and reverse. Head made of the best grade sand Cast Aluminum with hardened and ground gears and spindles (made in one piece). Full grooved ball thrust bearings at all thrust points and Oilite bronze radial bearings. *Remember to do more . . . better . . . faster . . .* rely on Errington Hi-Speed Production Tools.



LESS THAN ½ MINUTE TO CHANGE HEAD FROM DRILLING TO TAPPING OR TAPPING TO DRILLING

#0—0" to ¼" Tap Capacity
Min. centers 11/16"
Max. Pattern 5¼"

#1—7/32" to ½" Tap Capacity
Min. centers 1⅛"
Max. Pattern 8"

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*Established 1891*
*Main Office and Plant:* STATEN ISLAND 4, NEW YORK

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**. . . tells how to judge diamond quality.**

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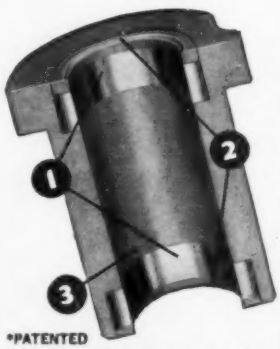


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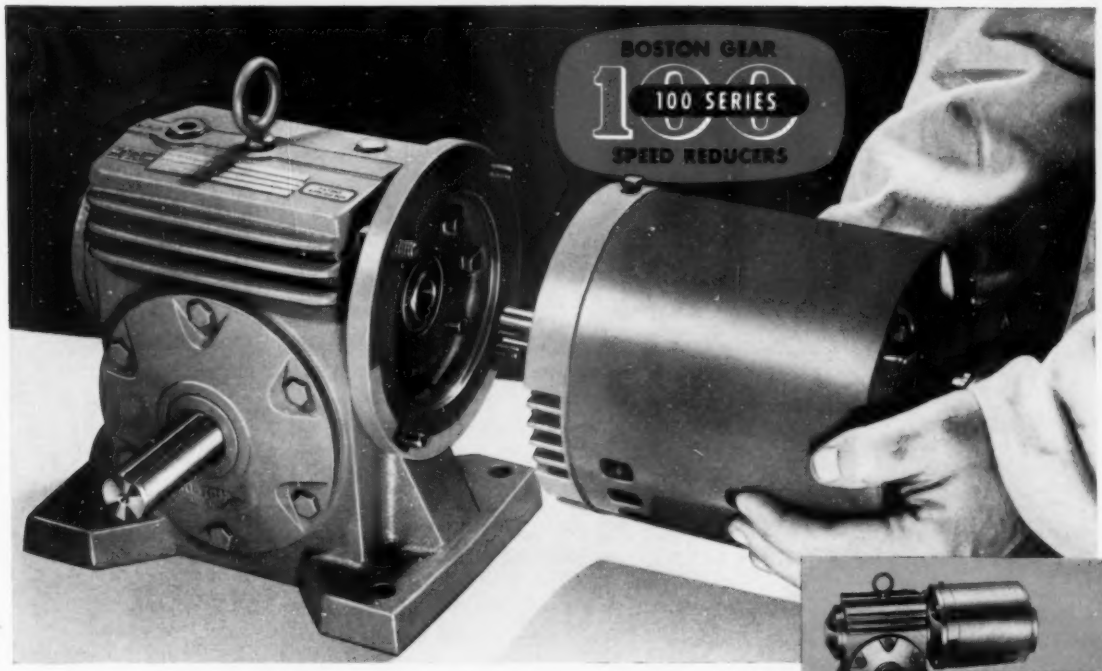


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# New COST-SAVING "COMBINATION"

### permits motor change in minutes
### . . . continued operation with spare

**The new 100 SERIES RATIOMOTOR** combines a gear reduction unit and an easily detachable, standard end-mounted motor.

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The complete power package, with motor.

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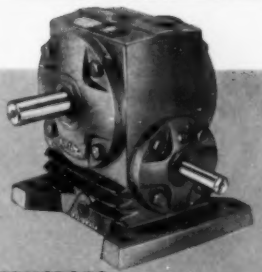
The Ratiomotor gear unit, supplied without motor. You buy and attach any motor you choose.



**REDUCTORS**
For mechanical drives, new 100 SERIES design saves space and weight. Housings are finned for improved cooling. Fan-cooling optional on larger sizes.

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*Certified*
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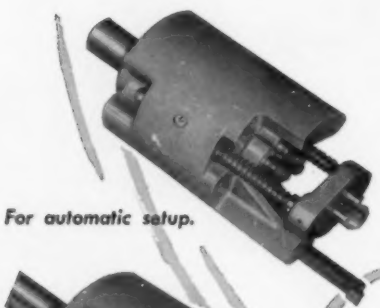
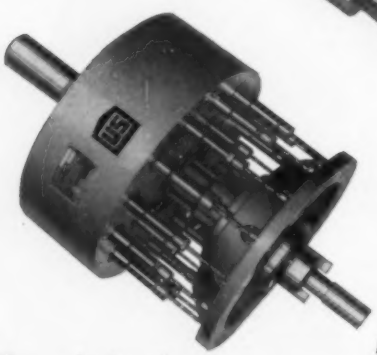
## U. S. DRILL HEADS, THAT IS!



*For automatic setup.*

*For semi-automatic setup.*



*For semi-automatic setup.*

Regardless of the size of your shop, if you have high production jobs, you'll find an extraordinary reduction in tooling and manufacturing costs when you use U. S. Drill Heads.

The heads shown here, moderate in cost, are for use with automatic chucking machines and turret lathes, for drilling or tapping operations. They provide, in most cases, that a part can be completely finished in one handling.

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This is the machine for you if you want precision flatness in production quantities at low cost. Lapmasters readily lap to the extreme close tolerance of one light band (.0000116") or less. In addition they produce an extremely fine finish to as low as 1 RMS. They are available with 12", 24", 48", 72" or 84" lapping plates.

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**I,** a heavy cast iron lap plate revolved slowly under power. **II,** large cast iron conditioning rings are held in position and rotate freely on the lap. **III,** work pieces are placed inside the conditioning ring where they also rotate on the lap. **IV,** a liquid vehicle containing fine loose abrasive flows on the lap plate and is uniformly distributed under the work pieces. At the same time the rotating conditioning rings preserve the flatness of the lap plate. These three essential features, combined with the rapid cutting action of loose abrasive produces a flatness which meets every production requirement.

**1** Operator requires no previous lapping experience.

**2** Lapping with loose abrasive and without excessive pressure eliminates heat and subsequent distortion.

**3** Simplicity of design provides accessibility and allows ease of loading and unloading.

**4** Loose abrasive distributed evenly over lapping area insured uniform results.

**5** Precision laps identical parts in one cycle or parts of various shapes, heights and materials in one cycle.

**6** Lap plate always kept in condition while in operation. No down time required for truing or reconditioning.

Learn more about the possibilities of production lapping and the interesting subject of measuring flatness. The illustrated fact-filled booklets are yours for the asking. Write today.

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*for the Most Exacting Requirements in Modern Tool Engineering and Production*

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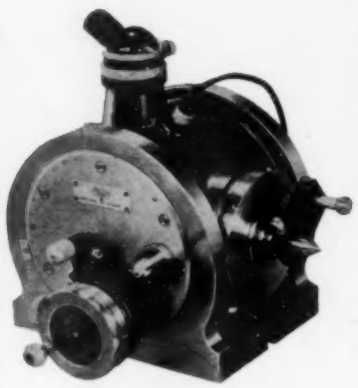
Adjustable indicating snap gauge. Scale reads to .0001 in. Range ± .0035 in. Even pressure constantly maintained. Five sizes covering an overall range from 0 to 6 in.



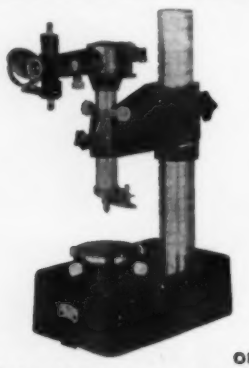
*New Model*

**OPTICAL DIVIDING HEAD**

Precision scale reading to 10 sec. of arc. Special presetting device. Sturdy construction—usable on a surface grinder or miller under heavy strain. Reinforced spindle. Indexing accuracy not affected by worm gear. Improved microscope for convenient reading in any spindle position.

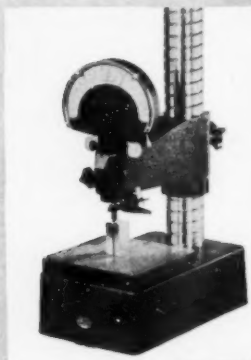
**ABBE METROSCOPE**

Direct measuring optical instrument. Ultra precision scale and spiral microscope. Measuring range 0 to 8 in. Reads to 0.00005 in.



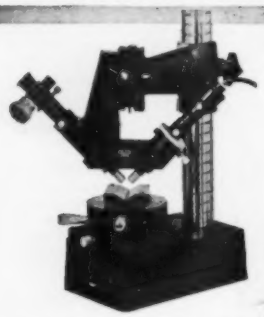
**OPTIMETER**

An optical precision indicator for checking dimensions by comparison with a standard gauge. Scale reads to .00005 in. Projection Optimeter reading to .00001 in. now available.



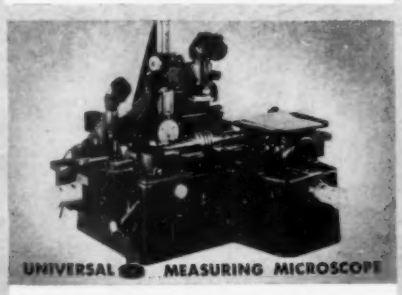
**ORTHOTEST**

Precision indicating instrument. For checking dimensions by comparison with a standard gauge. Scale reads to .00005 in. Range ± .004 in.



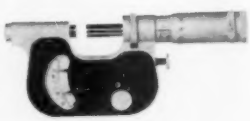
**SURFACE FINISH TESTER**

Optical slit microscope. For gauging the form, depth and frequency of tool marks on machined surfaces. For non-destructive surface roughness measurements to 0.00002 in.



**UNIVERSAL MEASURING MICROSCOPE**

For any and all types of measurements. Ultra precision glass scales with spiral microscopes. Measuring range: main slide, 0 to 8 in. Cross slide 0 to 4 in. Reads to 0.00005 in.



**INDICATING MICROMETER**

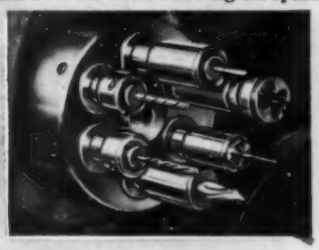
A combination micrometer and indicator enabling direct reading to 0.0001 inch and having advantage over the normal micrometer in excluding errors of "feel"—maintaining constant pressure on the part without the use of a rachet stop.

**For further information on these and other Carl Zeiss, Jena instruments, consult your dealer or write us.**

**ERCONA CORP.** *Scientific Instrument Division* **551 Fifth Ave., New York 17, N. Y.**

**Exclusive American Representative for VEB Carl Zeiss, Jena.**

Detail of drum turret showing six spindles



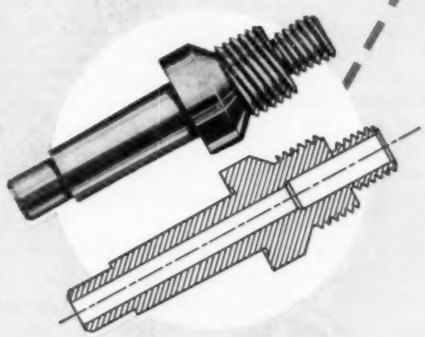
# TURRET LATHE VERSATILITY added to SWISS AUTOMATIC PRECISION

**ONE MACHINE COMBINES**
**6-SPINDLE AXIAL DRUM TURRET**
**WITH 5 CROSS TOOLS**

## BECHLER
SWISS AUTOMATICS

This remarkable combination has resulted in a Swiss Automatic of tremendous versatility. Addition of a six-station drum turret permits a wide variety of set-ups with *simple, standard* tools. The 11 separate tool stations permit production of completely finished, precision parts. Secondary operations are eliminated—output is increased—yet the precise performance of standard Swiss Automatics is retained. These machines are available in three sizes with capacities up to 1¼ inches.

Bechler Model AR-10
⅝" diameter capacity
5 Cross Tools—
6 Turret Stations



Steel precision part produced on AR-10. Diameter—.250", length—.750", 1 single and 1 double lead thread, recess and taper behind shoulder, bores concentric with outside diameters.

## TURRET FEATURES

- Six adjustable spindles—rotating or stationary—for centering, drilling, reaming, threading and tapping. Up to 4 of these spindles can be tooled for internal or external threads—right, left or mixed.
- Rapid, hydraulic spindle indexing—operated by standard, adjustable trip dogs instead of indexing cams.
- Accurate tool alignment—turret is securely locked on an extra large disc.
- Idle spindle travel reduced—horizontal turret positioned to suit length of workpiece.

**COSA** — *nationwide sales and service of precision machine tools —from bench lathes to boring mills.*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

Factory Service: — Bechler Service Corporation — Long Island City — New York

# SEE THESE OUTSTANDING MACHINES IN OPERATION AT THE ASTE SHOW

**The Maserati Corporation of America will demonstrate four of its outstanding machine tools at the ASTE exposition.**

**Come and see how efficiently these high-precision, low-cost machines operate. . . . the BLOHM HFS-4 horizontal surface grinder, the CASER FR-1 Radial Drill, the WESTBURY 1-S vertical milling machine and WESTBURY 3-U Horizontal Milling Machine.**

## BOOTHS 1806 and 1907

### CASER RADIAL DRILLS

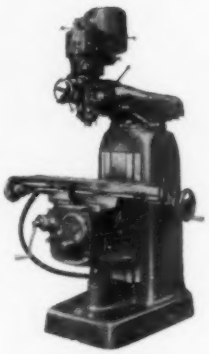
*MODEL FR-10/1250*
*Other Models FR-7, FR-9, FR-11*

**FEATURES:**

Single push button clamping of column and head • Single control for power arm elevation • Single control starts, stops and reverses spindle with pre-selection of all speeds while machine is running • Speed dial permits speed and feed selection while machine operates • Single knob feed dial can be operated while machine is running and feed is engaged

**Caser Radial Drills Are Available In The Following Sizes:**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ARM LGTHS. | 2'6" | 3' | 4' | 4' | 5' | 6' | 7' | 8' |
| COL. DIAM. | 8" | 10" | 12" | 14" | 16" | 17" | 22" | 22" |



### WESTBURY VERTICAL MILLS

*The Westbury 1-S and 1-R*

Hardened and ground high-speed ball bearing spindle — 5" quill travel, micrometer depth stop — Three feeds, .0016; .003; .005 — Rapid spindle change over, 8 speeds (80-2713) — Dovetailed overarm (1-S) — Round over-arm, (1-R) — Precision angle setting control — Rigidly mounted table — 42¾" x 9½" — 30" longitudinal range, 10" transverse, 16" vertical — Positive locks — Motor, 1.5 hp — Weight, 2200 lbs. The Duplomatic Duplicating Attachment Mod. FR for Milling Machines: Hydraulic precision reproduction of molds, patterns, and templates, in any material.

## BLOHM HORIZONTAL SURFACE GRINDERS

Cross movement by the table assures maximum precision and accuracy. Powerful heavy-duty 5 H.P. motor mounted directly on spindle operating on adjustable oilmatic bushings; pressure lubrication; use wheels up to 4" with cross feed up to 2½" per stroke.

These features plus the unusually sturdy overall construction, eliminate virtually all vibration and assures maximum concentricity. Exclusive BLOHM MICRO-TIP in-feed and depth-feed control permits automatic fingertip adjustments up to .0002" on cross feed and .00004" in depth feed.

### WESTBURY HORIZONTAL MILLS

*The Westbury 1-U, 2-U, and 3-U;*

Heat-treated, hardened spindle; all moving parts designed to withstand overloads in excess of 100% — Spindle mounted on adjustable tapered roller bearings — 12 speeds, 28 to 1100 rpm or 35 to 1600 rpm — dial and hand control for selecting and reversing — Splash lubricated spindle gear box, extra gear pump for added safety — Power feed and rapid traverse in all directions — Climb milling — Special safety devices prevent operating errors — All ways handscraped — Single lever engages rapid traverse to all movements.

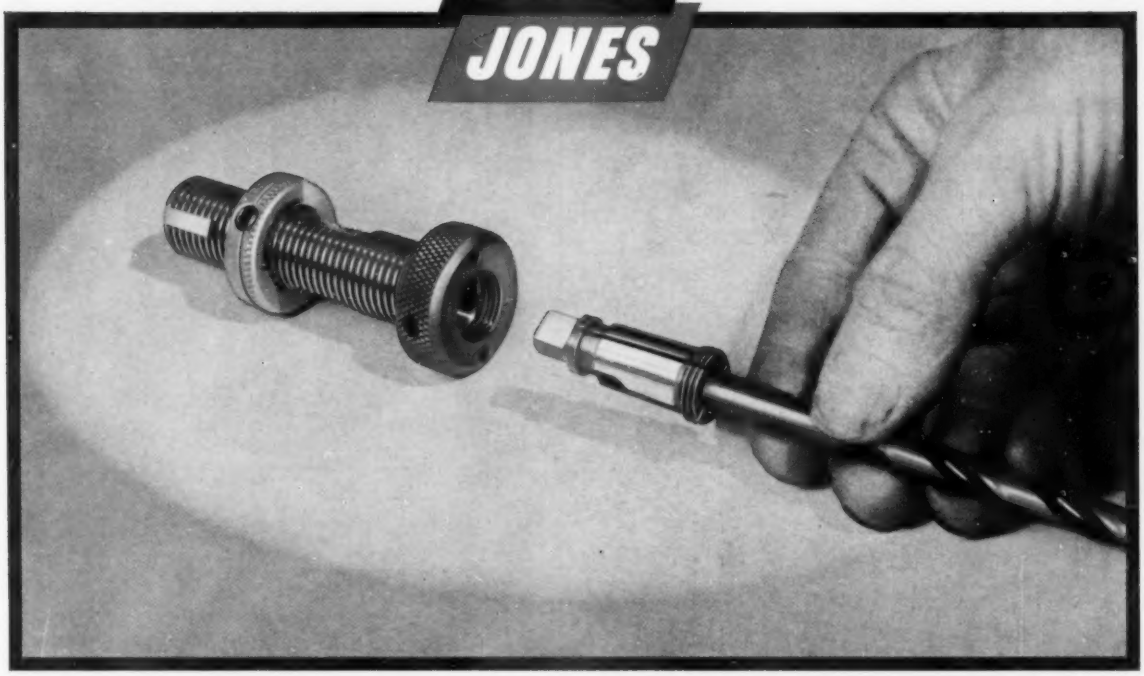
***Representatives in Principle Cities***

***Write, Wire, or Telephone for descriptive literature.***

MASERATI

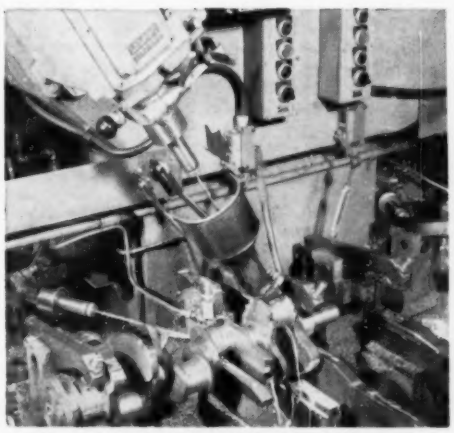
**MASERATI CORPORATION OF AMERICA** WESTBURY, NEW YORK

See Tools Demonstrated at **SCULLY JONES** A.S.T.E. Show, Booth 488



# NEW "Lock-and-Eject" Adjustable Adapters slash setup time 30 per cent!

Newest timesaving "Precision Holding Tool" from Scully-Jones is the lock-and-eject type adjustable adapter for use on multiple-spindle machines doing drilling, tapping, and similar jobs. High holding power, accuracy, quick and easy adjustment, and trouble-free operation are features of this new tool. An added benefit is the Scully-Jones ingenious lock-and-eject mechanism which minimizes tool pull-out, speeds and simplifies tool changes. Operator merely turns the threaded nut to seat and unseat the chuck which grips the tool. The nut revolves freely on ball bearings and eliminates pounding and torsion when changing tools. Collet action of the lock-and-eject chuck increases resistance to pull-out and assures accurate functioning of tools held. Application pictured is deep oil hole drilling on crankshafts for V-8 engines on a 10-station automatic transfer machine where this new tool solved a costly pull-out problem. Send for bulletin on this new tool.



Lock-and-eject adjustable adapters speed tool changes, assure holding power and accuracy.

SCULLY-JONES AND COMPANY, 1915 S. ROCKWELL ST., CHICAGO 8, ILL.

# SCULLY-JONES

## "Precision Holding" for holding precision

Call your Scully-Jones representative or distributor—factory-trained "Precision Tool and Work Holding Specialist"—fo complete information and service.

# FLIP THE SWITCH and Automatic Sawing is Yours!

Model M-16 for cutting non-ferrous metals. One of three models available.

## Stone's New FULLY AUTOMATIC Bar-Feed Cut-Off Machine

**For Fast, Low-Cost Production Line Work**

| | |
|---|---|
| **ELECTRO-PNEUMATIC BAR FEED** | Automatically grasps single bar aluminum, brass, copper, magnesium or other non-ferrous metal, moving it exact distance required for cutting. |
| **AUTOMATIC POWER STROKE CUTTING HEAD** | Up to 1600 cuts per hour with a milled finish that eliminates need for further machining. Tolerances are held to .005" or less. Many runs have already produced tolerances of .001" for 90% of production. Cutting head is engineered with geared-in-head drive (a Stone exclusive) —delivering maximum power at lowest cost. Cuts any desired length, ¼" to 6 feet, with larger capacities on request. Capacity, 3½" solids, 5" OD tubing and extrusions. |
| **OIL MIST SPRAY LUBRICATION** | Saw blade is automatically lubricated with fine oil mist spray to give faster, cleaner cuts. Blade lasts longer and you get more cuts between sharpenings. |

**A Stone Cut-Off Machine for Every Operation** Whether you're cutting ferrous or non-ferrous metals, in everything from bar to sheets and plate, there is a Stone cut-off machine to meet your exact specifications. Write or call Stone Machinery Co., Inc. for complete details. No cost . . . no obligation.

**Visit Our Display At the ASTE Show BOOTH 755**

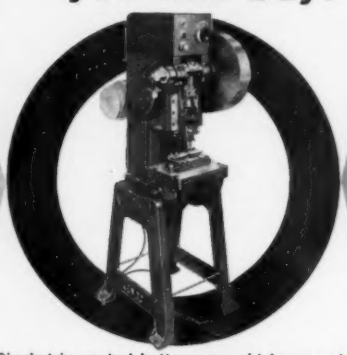
***"...represented in every major industry throughout the world"***

**STONE MACHINERY COMPANY, INC.**

**31 Fayette Street, Manlius, New York**

USE READER SERVICE CARD; INDICATE A-3-482-1

# KENCO 15-ton ELECTRO-SAFE – the safest punch press you can buy!



Single-trip control buttons are widely spaced, to keep hands clear of the danger zone. Operator must push **both** buttons at once... hold them until stroke reaches bottom, then release both buttons to start new cycle. Fail-safe operation. Impossible to "fudge." Impossible for press to double trip.

**VERSATILE CONTROLS**—You can change from "single trip" to "continuous stroke," or "inching" by merely turning a dial. You can change timing in seconds. No flywheel... no clutching. Write for details.

**KENCO MANUFACTURING CO.**

*Mfrs. of Precision Machinery and Accessories*

**5211 Telegraph Road, Los Angeles 22, California**

**See our Display, Booth 618—ASTE Show**

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# SEE . . . . IN ACTION!

- HIGH PRODUCTION GENERAL PURPOSE MARKING MACHINES
- AUTOMATIC SPECIAL PURPOSE MARKING UNITS
- HIGH-SPEED INDUSTRIAL PRINTING EQUIPMENT

**at Matthews' A.S.T.E. BOOTH NO. 662**

A staff of experienced marking consultants in attendance at all times to offer complete recommendations to solve any of your product marking problems.

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**Marking Specialists Since 1850**

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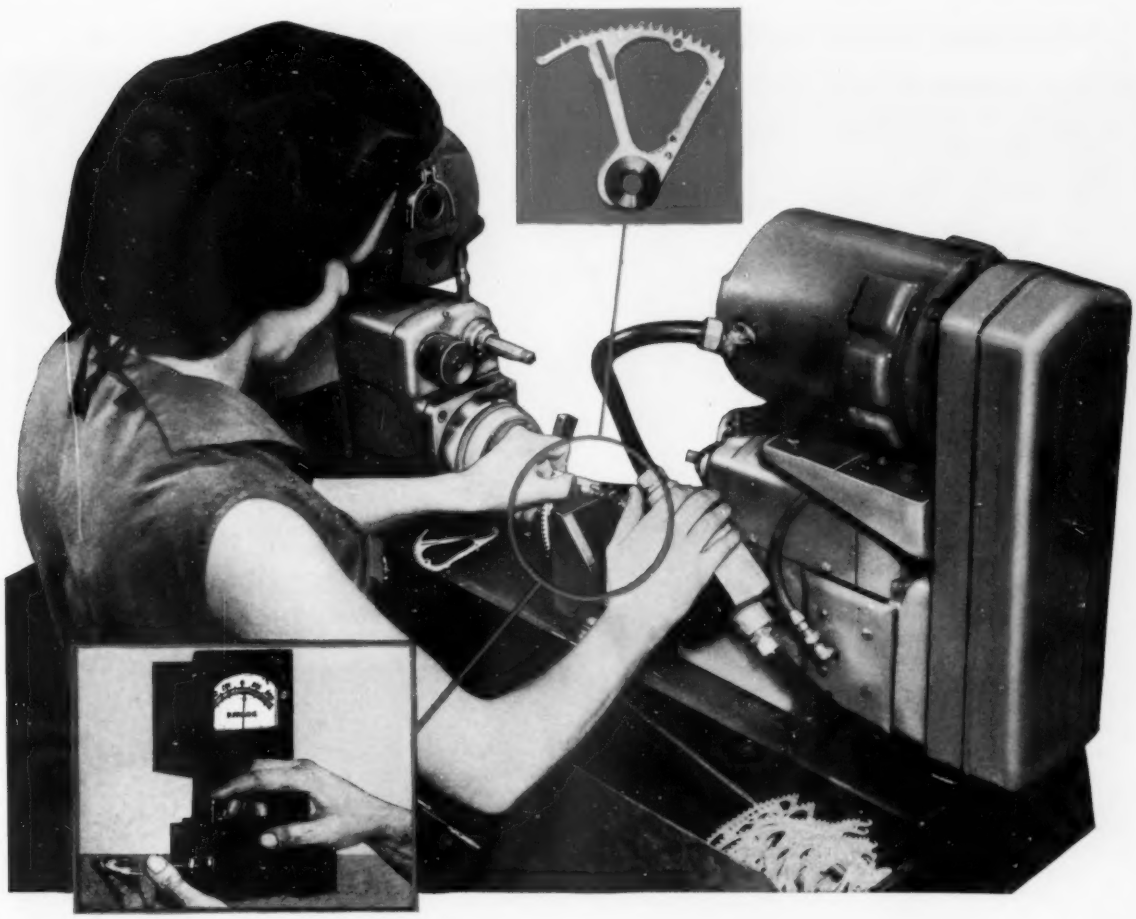


# "HARTFORD" Air Hydraulic Drill Units used by Burroughs* to hold precision thickness tolerance

**SPOTFACING BOTH SIDES OF A WAFER THIN STEEL GEAR SECTOR TO A THICKNESS TOLERANCE WITHIN .0003" IS ONLY ONE OF THE ADVANTAGES BURROUGHS OBTAINS BY USING HARTFORD DRILL UNITS.**

***Add up these facts:***

1. SPINDLE ACCURACY of units holds parallelism of machined faces.
2. MICROMETER DEPTH CONTROL of Drill Units provides *positive* stop.
3. PRODUCTION DOUBLED over previous method of facing one side at a time. Machining cost cut in half.
4. EXTREME LOW COST of special machine through use of *standard* Hartford components.
5. REJECTS ELIMINATED because the accuracy is *built into the machine.*

*Internationally famous makers of Sensimatic accounting machines.

**Another example of better products at lower cost through better methods.**

MACHINE TOOL DIVISION
THE HARTFORD SPECIAL MACHINERY CO.
280 Homestead Avenue, Hartford 12, Conn.

A-506-3

☐ Have Field Engineer call.
☐ Send Application Data Sheet and descriptive Bulletin.

Name _____
Company _____
Street _____
City _____ Zone ____ State _____

HARTFORD *Special*

**Gardner-Denver . . .** Serving the World's Basic Industries

6-spindle Multiple Nut Setter assembles auto flywheel to crankshaft.

# A New Keller Tool Fastening Technique Sets New Highs in Assembly Efficiency

**Results: reduced costs — control of quality**

If you have to set two or more nuts or bolts at a time, you've got a job for Keller Tool Multiple Spindle Nut Setters.

In one simple unit, from 2 to 20 spindles do the work in a fraction of the time required with a single spindle tool.

**Designed for extreme flexibility:** Standard air motors of any size can be combined in the same tool. Tight bolt clusters . . . different torque requirements . . . bolts at different elevations are adaptations. Handles and suspension can be positioned where desired. Let Keller suggest a setup for you.

**Features you can use—profitably!**

1. Adjustable torque control on individual spindles. Fourteen sizes cover torque range from 4 to 190 ft.-lb.
2. Torque held to close tolerances—equal to that of accurate hand tools.
3. Easily adapted to changing needs—a new mounting plate does the trick.

## GARDNER - DENVER

**KELLER TOOL division, Grand Haven, Michigan**

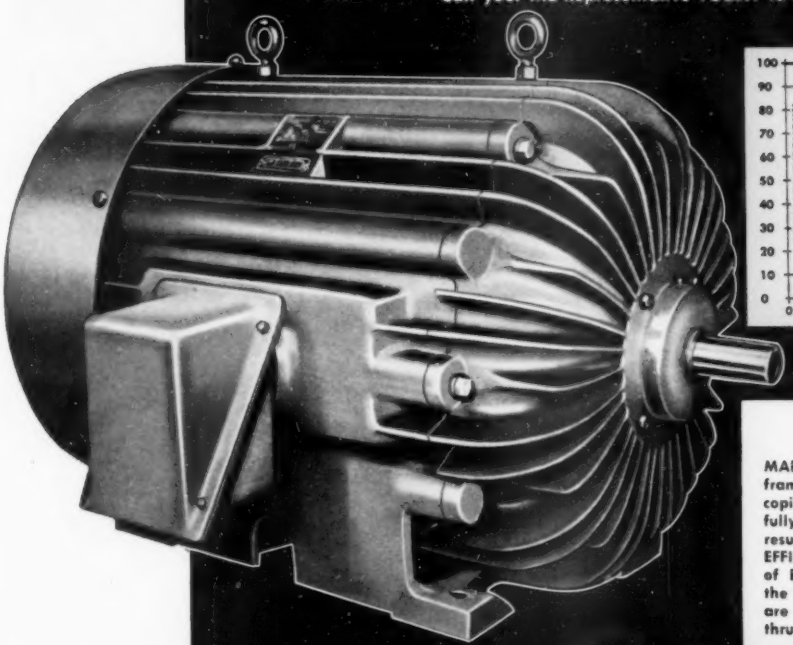
THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

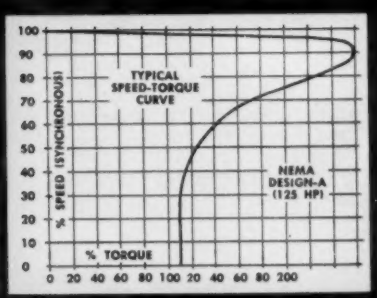
# WHY MARATHON ?

• EXPERIENCE OF PROVEN PERFORMANCE . . . OVER HALF A CENTURY
There is no substitute for the reliability of proven performance. Top Names of the Nation's Industry have proven ME performance in ENGINEERING . . . DESIGNING . . . PRODUCING QUALITY PRODUCTS.

• VERSATILITY WITH A WIDE RANGE OF DESIGN
MOTORS 1/20 thru 2500 HP . . . GENERATORS ½ thru 2000 KW . . . Single Phase, Polyphase, Direct Current . . . Standard or Special . . . Marathon Electric can design to meet your special specifications.

• SERVICE THROUGHOUT THE NATION
MARATHON ELECTRIC has a DISTRICT OFFICE or Representative near you. Call your ME Representative TODAY to help solve your motor problem.






## EXPLOSION PROOF MOTORS

MARATHON ELECTRIC'S familiar ribbed frame construction has already been often copied but never duplicated. This carefully developed rib design formula has resulted in the COOLEST, CLEANEST, MOST EFFICIENT, and MOST COMPLETE RANGE of EXPLOSION PROOF MOTORS to carry the Underwriters' Laboratories Label. They are available in NEMA frame from 56 thru 680 series, from 1/12 thru 250 HP.

All ME Explosion Proof Motors Carry Underwriters' Laboratories Inc. INSPECTED Label in 1/12 HP Through 250 HP Ratings

SINCE 1913

MARATHON ELECTRIC

HOME OFFICE AND FACTORY, WAUSAU, WIS. — FACTORIES AT ERIE, PA. AND EARLVILLE, ILL.

SALES OFFICES IN PRINCIPAL CITIES

Write or Wire SPADE 80 for further Information

# Introducing new ROTARY

# streamlined TORRINGTON SWAGING MACHINES

*featuring...*

- **maximum capacity for size and power**
- **convenient location of controls**
- **easy access for maintenance**
- **integral storage space**
- **modern styling and color**

Styled in keeping with the dynamics of industry today, each new Torrington Swaging Machine embodies many engineering and design improvements.

Over-all dimensions of dies, backers, rolls and flywheel have been carefully engineered to provide the greatest swaging capacity possible for given machine size and horsepower. Moving parts are made of the finest grade tool steels, hardened and finished by the most advanced methods. Special grade Krupp steel materially improves life of inside rings.

Controls, gatehandle and flywheel guard opening are located on the left side of each machine for easy, natural operation. The new base design allows ready access to power and drive mechanism for easy maintenance.

Scientifically styled to eliminate the distraction of moving parts, the machines also embody improvements that subdue noise.

Whether you are pointing, tapering, reducing or shaping rod or tube, do it the *modern* way by swaging... on a *streamlined* Torrington Rotary Swaging Machine. For complete details, please write.

**THE TORRINGTON COMPANY**
*Swaging Machine Division*
444 North Street, Torrington, Conn.

**See the new streamlined**
**TORRINGTON ROTARY SWAGING MACHINES**
**at Booth 219, ASTE Exposition in Chicago, March 19 to 23.**

| Model Number | Work Diameter Solid* | Tube |
|---|---|---|
| 100 | 1/16 | 1/4 |
| 111 | 1/8 | 5/16 |
| 211 | 3/16 | 1/2 |
| 312 | 3/8 | 7/8 |
| 423 | 5/8 | 1½ |
| 1023 | 1 | 1½ |
| 434 | ** | 2½ |
| 436 | ** | 2½ |
| 438 | ** | 2½ |

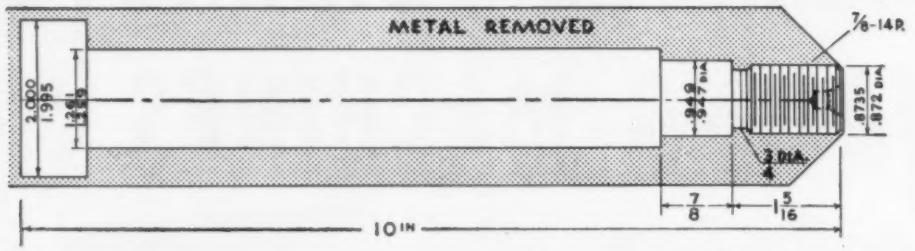
Three light-duty Swaging Machines are available complete with motor and stand containing storage space for dies and tools. New stand design permits operator to sit at his work. These models are also supplied without stand, hood or motor for use as bench machines.

New Streamlined Torrington Swaging Machines are available in any of six heavy-duty models for swaging of larger size solid and tubular stock.

* Solid diameter capacities listed as a general guide only. They can be exceeded depending on type and hardness of material and extent of reduction.

** For capacity on solid work, refer to Torrington Engineering Department.

# HERE'S REAL BREAD-AND-BUTTER PRODUCTION!




***Warner & Swasey 1-A combines power and instantaneous speed changes with standard tooling for top efficiency on this small lot job.***

The practical shop man knows that, after all the smoke has cleared about fancy attachments and special tools, most small lot work depends on his real "bread and butter" producer—the versatile, standard-tooled turret lathe.

And here's a typical small lot bar job, a 10-inch pinion shaft, that demonstrates this point. It requires the flexibility of standard tooling, power to really hog metal, and a fast selection of the most efficient cutting speeds. A new Warner & Swasey 1-A Extra Heavy Duty Turret Lathe, equipped with standard tools, does the job in 4½ minutes—*real metal turning efficiency!*

It requires a variety of cuts with 7 speed changes. The 1-A's 16-speed, all-clutch head, with its pre-selector, delivers them instantaneously! With a two-speed motor, a total of 32 unduplicated speeds provided a wide range from which the seven most efficient could be selected.

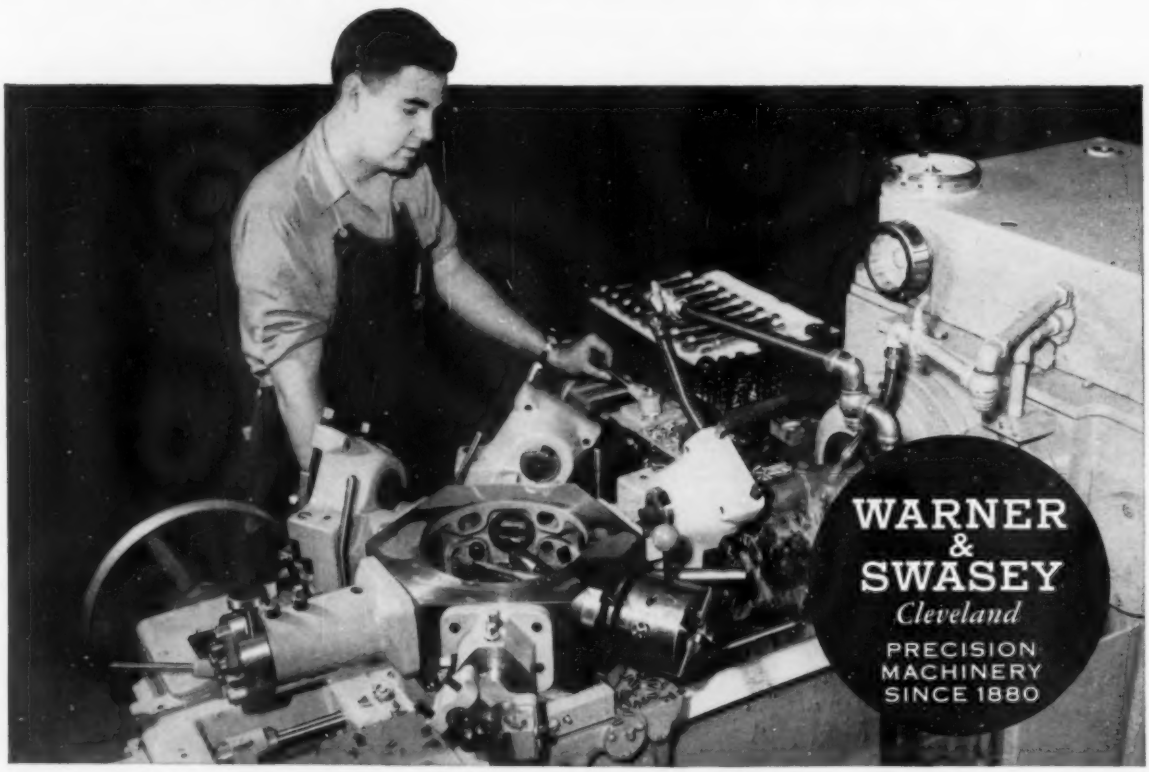
First cut in this high carbon steel is taken with a standard single cutter turner, using a carbide cutter. It is ½-inch deep and consumes 30 horsepower! This shows the necessity for a Warner & Swasey's power in a machine this size.

Second and third turning cuts are also taken with single cutter turners, using mechanically-held carbide tipped, throw-away cutters.

Two speed changes are made during the cutoff operation, again showing the advantage of instantaneous speed changes under cut, without effect on the carbide cutter.

Traditional Warner & Swasey ease of machine handling, enhanced by the new hydraulically-operated collet chuck and bar feed, not only cuts cycle time but cuts operator fatigue—puts more pieces on the floor at the end of each day!

Compare this job with similar ones in your shop. If the comparison indicates a need for greater turning efficiency, call in your nearest Warner & Swasey representative.




YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

a cordial invitation to see

# SUPERIOR DIE SETS

## Booth 338

**A. S. T. E. EXPOSITION . . .**

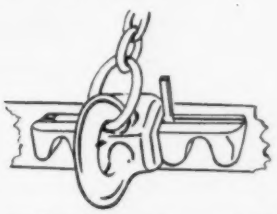
. . . Where courteous representatives will be on hand to demonstrate how Superior Die Sets speed assembly, disassembly and overall handling of large and small die sets . . . How they provide protection for skilled hands of die makers and how Superior Die Sets protect against the dangers of ruining costly dies and press equipment.

*See These Exclusive Features!*

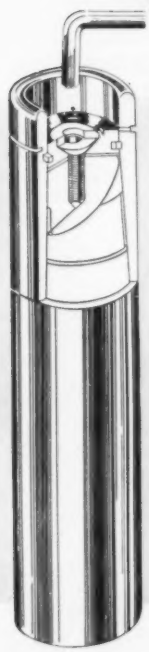
**SAFETY FLANGES**

protect fingers by providing roomy gripping space on either side of die shoe.

**LOCK JAW LIFTING DEVICE**



Permits lifting of small and large sets . . . die set can be turned over without clamping . . . Positive safety . . . Self locking . . . Simple, easy to use.

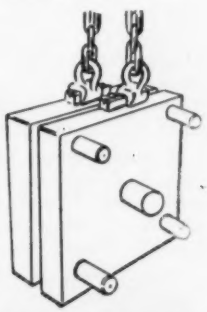


*Removable Cap*
**GUIDE PINS**

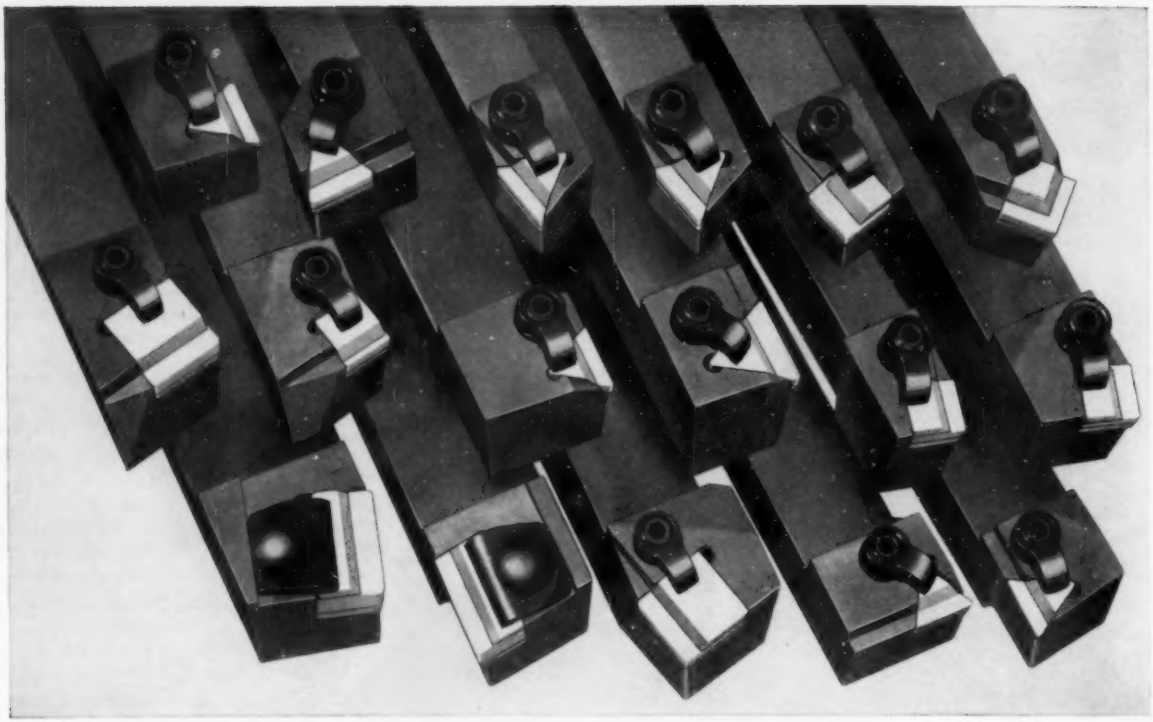
end troublesome binding in die set assembly work . . . Hexagon key removes caps to free punch holder . . . Dies part quickly and easily.
Instead of needing 2 or 3 die makers to remove the punch holder from a set, one man can easily do this work alone in a few minutes.
Now standard upon specification on all Superior Die Sets in pin diameters of 1¼" upward.

**E-Z LIFT SLING CHAIN**

Male jaws attached to the sling fit quickly into the safety flanges for immediate lifting . . . No need for "C" clamps, eye bolts, or lifting lugs.



**SUPERIOR STEEL PRODUCTS CORP.**
2754 S. 19th ST., MILWAUKEE, WIS.



17 Kendex† holder styles and 101 different tools

# KENNAMETAL* today offers the tooling for tomorrow

Kendex Button and Heavy Duty tools can truly be considered as the "Tooling for Tomorrow."

Kendex holders are simple and rugged in construction; fitted with trouble-free, interchangeable "hardware"; accommodate square, round and triangular turnover, throw-away button inserts that eliminate costly grinding . . . all features needed to keep tomorrow's high speed, highly synchronized production lines on the go—hour after hour.

"Tooling for Tomorrow" must face up to varied cutting jobs, on many types of machines . . . machines that will require quick, accurate tool changing for close tolerance work at high speeds and low costs per piece. Kendex tooling was designed for such conditions. In addition, it increases efficiency; lowers tool investments; sharply reduces maintenance costs. There are over 100 Kendex tools and 35 different Kendex inserts—some stocked in as many as six Kennametal grades.

Why not have a Kennametal tool engineer help you step up efficiency on today's jobs with Kendex "tooling for tomorrow." He works exclusively with Kennametal tooling . . . applying and servicing it. This specialized experience is yours for the asking. KENNAMETAL INC., Latrobe, Pennsylvania.

## Eleven Kennametal Grades . . . To Give You Top Performance

No matter how versatile or rugged the toolholder—final performance depends on the cutting edge. Here's where hard, uniform, dependable Kennametal blanks and inserts will pay off on your operations—regardless of the job or machine. With eleven grades to select from, you can get top performance on every cutting job.

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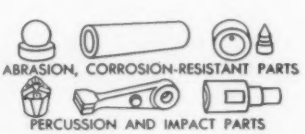

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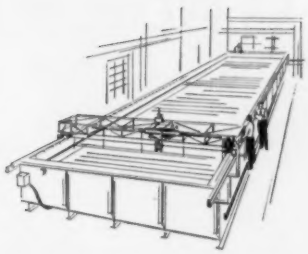

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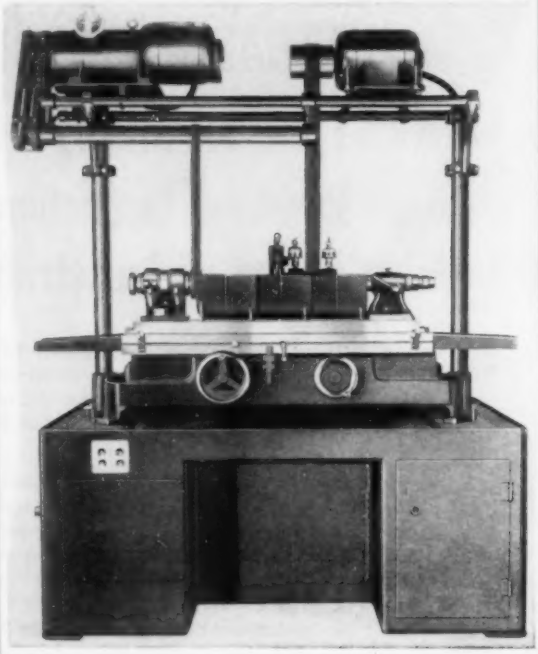
In order to accomplish this CRYSTAL LAKE uses double taper cone bearings that are pulled into solid bronze boxes. CRYSTAL LAKE introduced their One R.M.S. Grinder in 1936 featuring their separate motor drive, eliminating cine-wave and providing ample power as a motor larger than wheel head can be used. To produce a One R.M.S. a heavy oil drag has to be placed on bearings. When a spindle is round and held tight in solid boxes, sizing is easy. Spindle, if necessary, can be stopped for measuring of small work, as motor recoil is taken up by springs on hinged motor plate.



As an example of the advantages of the overhead drive, we use our No. 1018 Universal Grinder which is equipped with a 2 horse power motor mounted overhead driving the wheel head spindle ninety degrees from grinding wheel pressure which keeps the bearings round and doubles their life. A one horse power drag is placed on a 2⅛" Diameter spindle so wheel will have to cut round. Bearings can be adjusted from time to time by using Dial Indicator to set end play.

Along with the two horse power on the Wheel Spindle a ¾ h.p. Speedranger is used on the Headstock so a ½ h.p. drag can be placed on double taper headstock bearings. Headstock will grind round from .000005" up.

Table can be moved easily as several hundred pounds are taken off table by this mounting.

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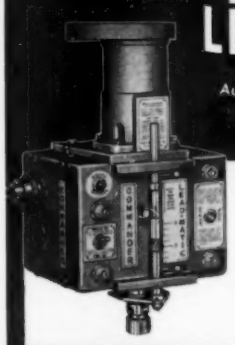
*Automatic Tapper with Lead Screw*
FOR HIGH PRODUCTION PRECISION TAPPING



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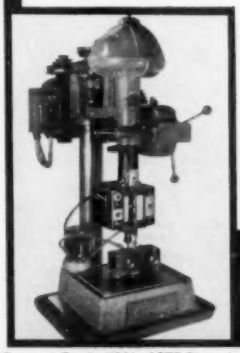

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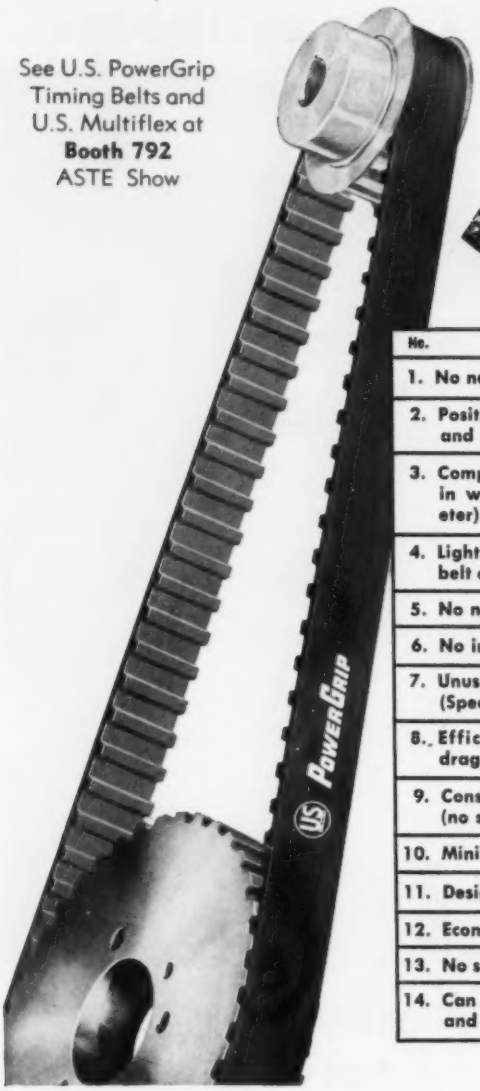


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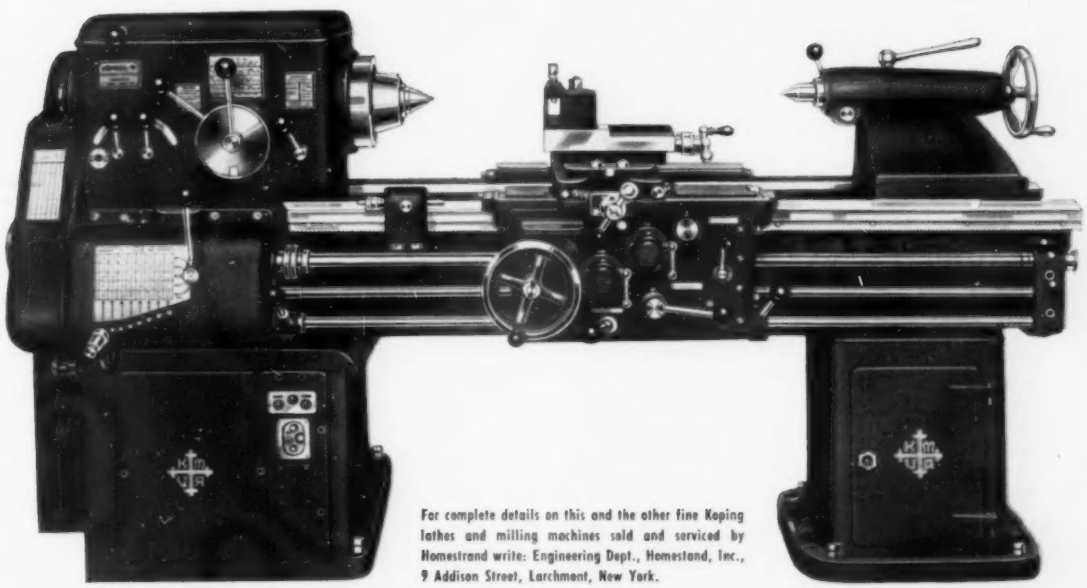
**SPECIFICATIONS**

| | |
|---|---|
| Swing over bed | 17⅛" |
| Spindle speeds, number | 18 |
| Spindle speeds in geometric progression | 30-1500 r.p.m. (and others) |
| Thread pitches per inch threads, number | 72 |
| Motor | 15 HP |
| Net weight w.o. motor | 4850 lbs. |



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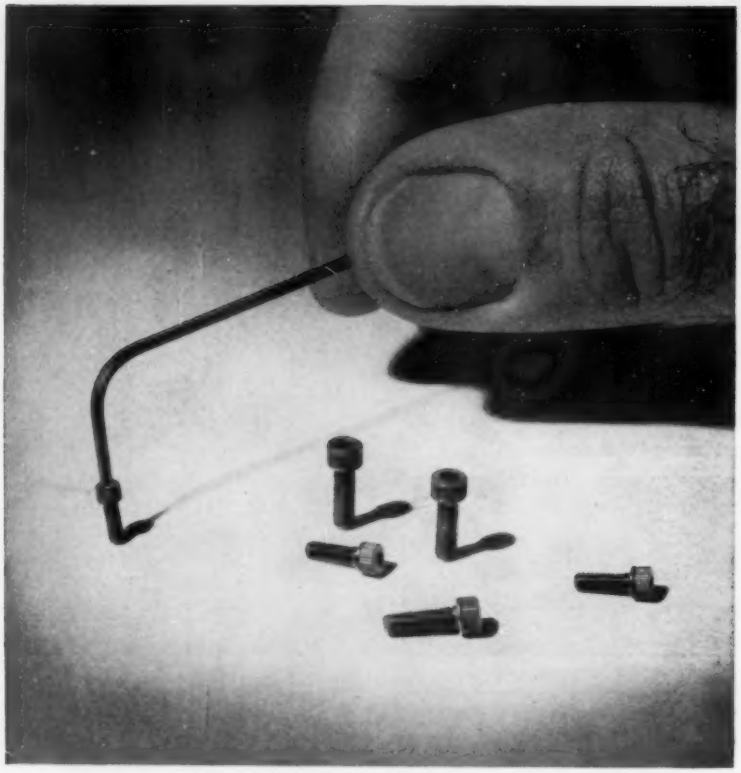

**Standard UNBRAKO miniature socket head cap screws** are available in sizes # 0, # 1, # 2 and # 3, in heat treated alloy steel or stainless steel, at your authorized industrial distributor's. Standard lengths range from ⅛ to ½ in.

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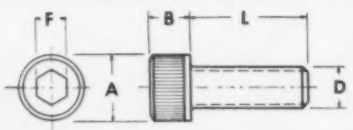


| | Diameter | Threads per Inch NC | Threads per Inch NF | Length | Recommended Installation Torque in Inch-Pounds NC | Recommended Installation Torque in Inch-Pounds NF | Weight per 1000 in Pounds |
|---|---|---|---|---|---|---|---|
| #0 | A .104 | | 80 | ⅛ | | 2.0 | .152 |
| | B .060 | | 80 | 3/16 | | 2.0 | .182 |
| | D .060 | | 80 | ¼ | | 2.0 | .210 |
| | F .050 | | 80 | ⅜ | | 2.0 | .265 |
| #1 | A .118 | | 72 | ⅛ | 3.5 | 3.5 | .27 |
| | B .073 | | 72 | 3/16 | 3.5 | 3.5 | .32 |
| | D .073 | | 72 | ¼ | 3.5 | 3.5 | .37 |
| | F .050 | | 72 | ⅜ | 3.5 | 3.5 | .47 |
| #2 | A .140 | 56 | | 3/16 | 6.0 | 6.0 | .42 |
| | B .086 | 56 | | ¼ | 6.0 | 6.0 | .50 |
| | D .086 | 56 | | ⅜ | 6.0 | 6.0 | .58 |
| | F 1/16 | 56 | | ½ | 6.0 | 6.0 | .70 |
| #3 | A .161 | 48 | | 3/16 | 8.5 | 9.5 | .59 |
| | B .099 | 48 | | ¼ | 8.5 | 9.5 | .70 |
| | D .099 | 48 | | ⅜ | 8.5 | 9.5 | .81 |
| | F 5/64 | 48 | | ½ | 8.5 | 9.5 | 1.03 |

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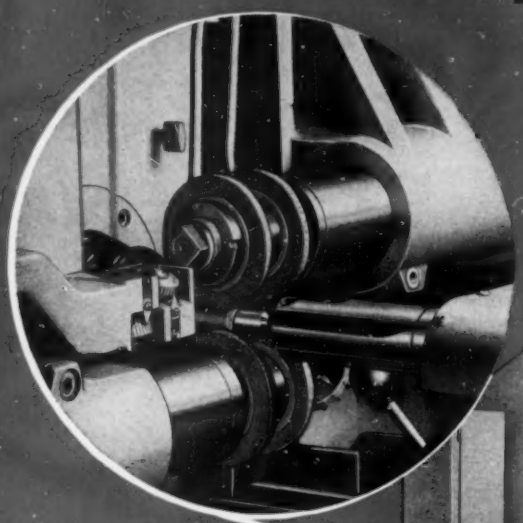

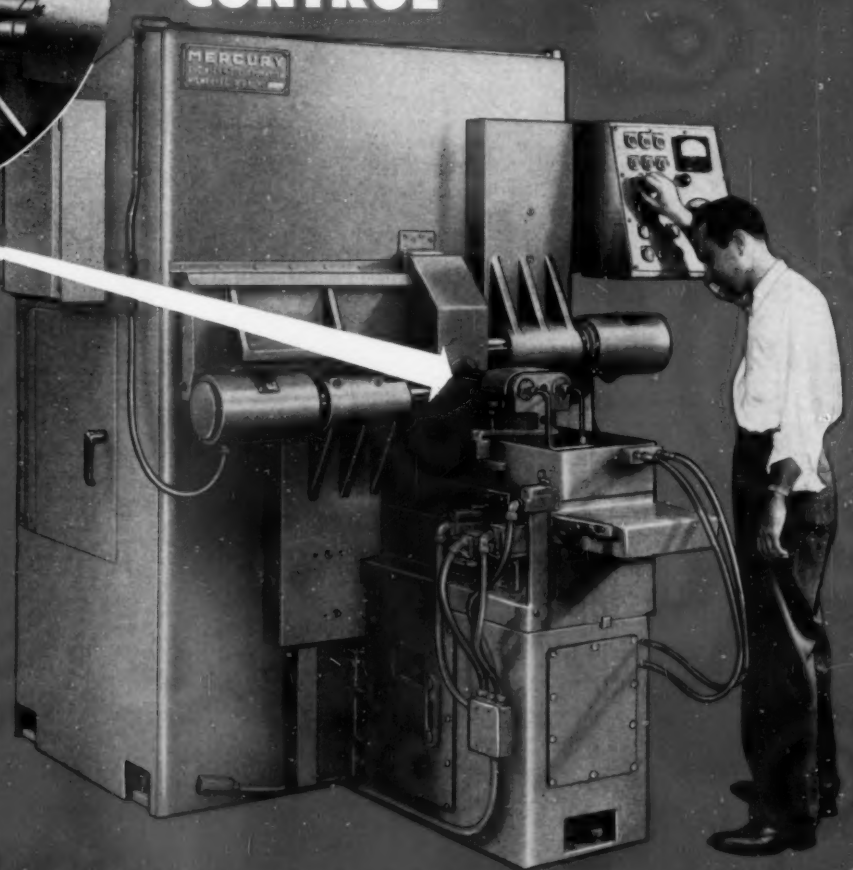


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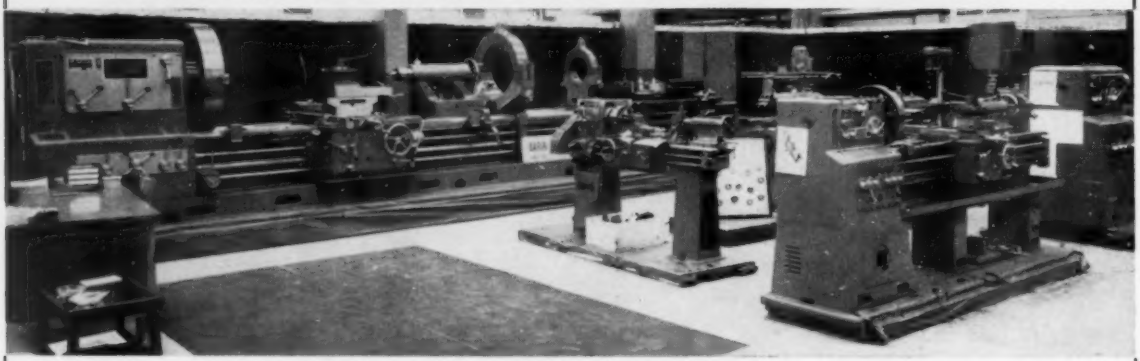

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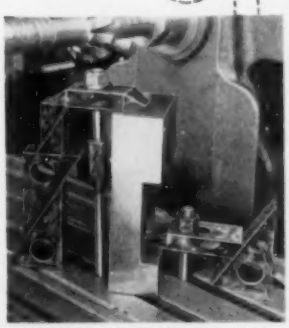

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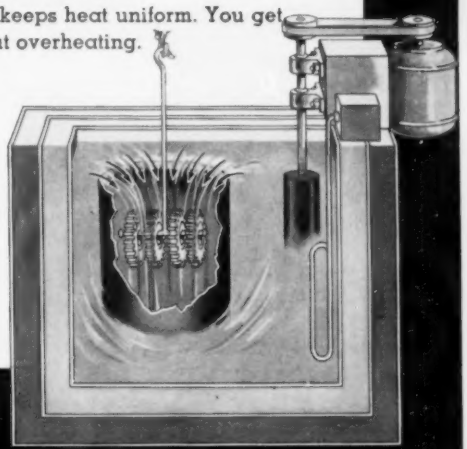

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# phase of **Inner Diameters**

| Diameters 5/32" to 2" | Diameters 2" up | Diameters 1/4" to 12" | Diameters 3/4" up |
|---|---|---|---|
| | | | |
| For producing truer, more accurate, finer finished holes, in one operation from the solid through gun-drilling techniques, use MADISON Deep Hole Drilling Tools. Unexcelled for both deep and shallow drilling applications. | Where relatively large diameters are to be produced from solid stock, use MADISON Trepanning Tools. Through solid-core removal, faster cycle time, saving of material and reduction of horsepower requirements are realized. Depth of hole is unlimited. | To obtain a mirror-smooth burnished surface in any cylindrical bore, regardless of length, use MADISON-FAESSLER Roller-Burnishing Tools. Micrometer adjustment. Self feeding. Quick, simple operation. | For checking the accuracy of the hole produced, use MADISON Adjustable Boregages. Sets available in individual combinations or to cover the complete range of holes. Speeds gaging operation, cuts gage inventory cost. Ease of setting provides rapid change in size or tolerance. |

MADISON

**MADISON**
**MANUFACTURING CO.**
**INDUSTRIES, INC.**
**– FAESSLER TOOL CO.**
**MUSKEGON, MICHIGAN**

*"inner diameters are our business"*

***Get the Hole Story at the***

**A. S. T. E. Industrial Exposition**

**MADISON BOOTH – No. 1209**

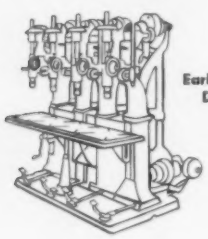
Qualified MADISON representatives will be in attendance throughout the entire show to discuss with you any hole problems, whether in the planning stage or in production. You'll also see representative tools of MADISON'S complete line.



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-3-501

# W. F. & JOHN BARNES 1872-1956 FROM

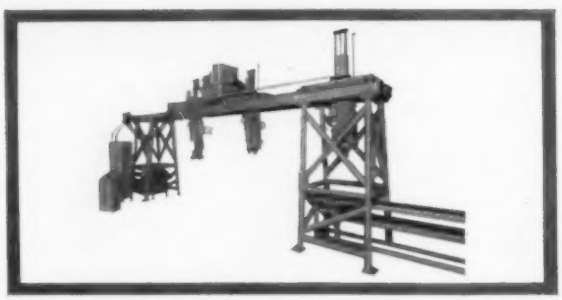
Foot Powered Scroll Saw

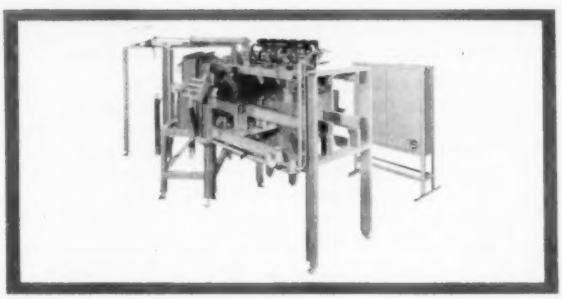


Early Gang Driller

It was back in 1872 when the ox cart was still used for transporting goods and Edison was still experimenting with the electric light, that W. F. & John Barnes built their first industrial machine — a Foot Powered Scroll Saw. Later in the 1880's, the first Gang Drilling Machine was designed and built. This forerunner of the modern machine tools of today was shipped by ox team to a customer in a nearby town. Three days later, the records say, it arrived at its destination — a distance of 40 miles.

It is also a matter of record that all through these years, from oxen to jets, machines bearing the W. F. & John Barnes' name have been consistently associated with progressive developments and improvements in manufacturing methods. As a result, when you specify a Barnes' built machine today, you get a creative engineering and building service that is seasoned by experience — one that is complete and geared to serve your needs better than ever before.





▲ **SPECIAL CONVEYORS** — typical of variety of units designed and built from standard components to increase material handling efficiency between machining operations. Engineered to meet individual job requirements.

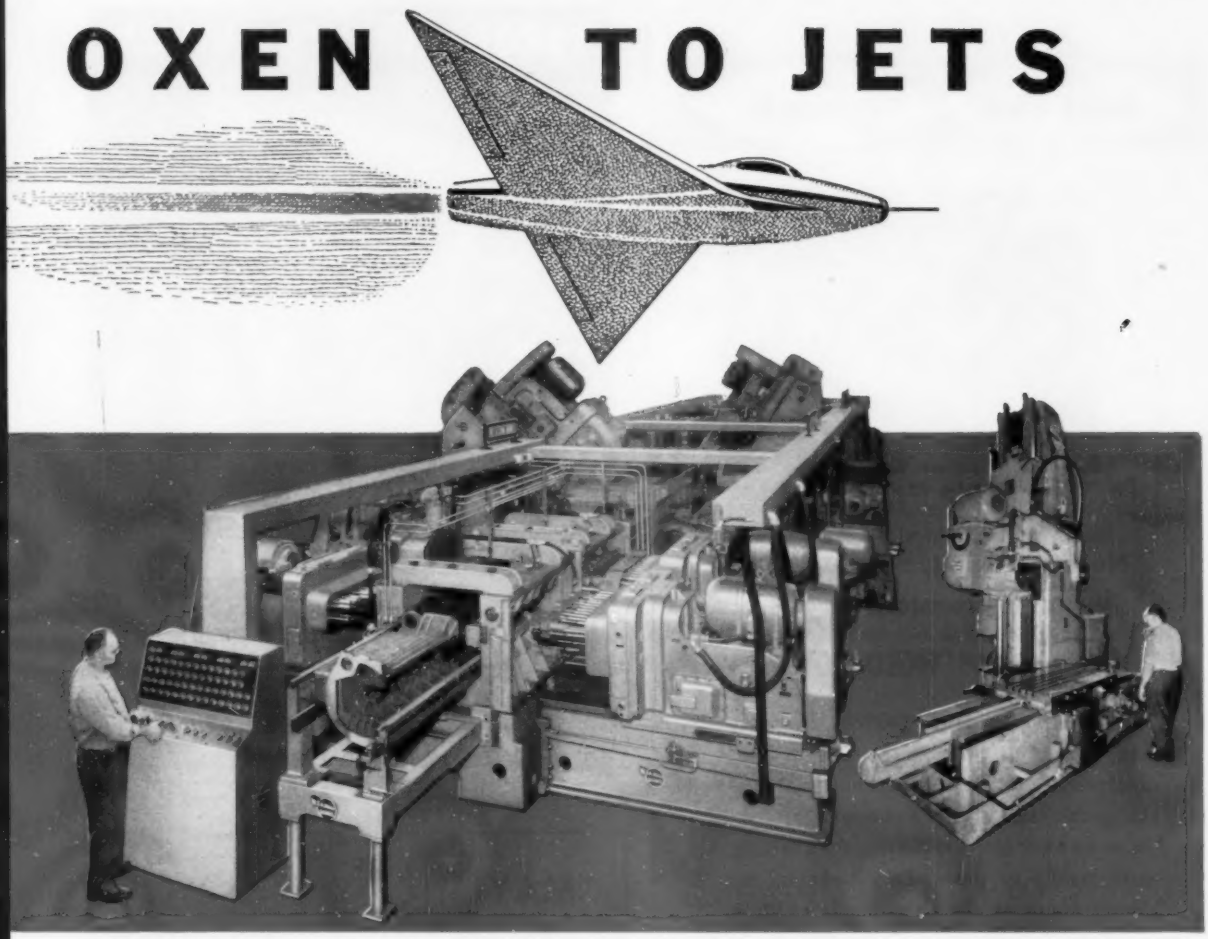
▲ **SPECIAL AUTOMATION EQUIPMENT**—includes a range of turn mechanisms, (illustrated), special transfer and unloading equipment, inspection, and assembly machines, designed for automatic or semi-automatic production-line operations.

W. F. & JOHN BARNES

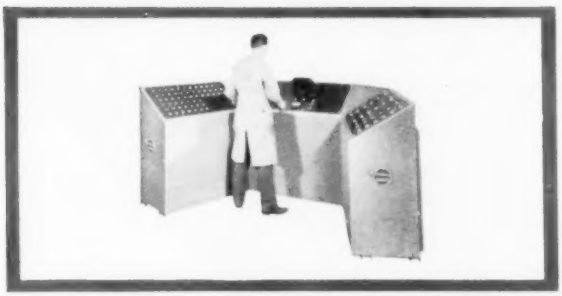
BUILDERS OF BETTER MACHINES SINCE 1872

MULTIPLE SPINDLE DRILLING • BORING • TAPPING

# OXEN TO JETS



**MODERN MACHINE TOOLS** — units illustrated are typical of the large Progress-Thru and Single Station units designed and built by Barnes. 11-Station unit at left was designed to machine both 4 and 6-cylinder tractor engine blocks at 25 pieces per hour. Single-spindle machine at right slab and face mills motor frame mounting pads at 6½ pieces per hour.



**SPECIAL ELECTRICAL CONTROLS** — a typical Barnes unitized control system of the sequence type. All are designed to assure the most dependable service and are built to best serve your specific needs.

**ELECTRO-GRAPHIC DETECTOR SYSTEMS** — a new, exclusive Barnes development. Cuts maintenance time on complex electrical controls up to 90%. Wired-in checking system pin-points malfunctioning elements.

***Write*** **FOR FREE LITERATURE** — New 8-page brochure illustrates and describes Barnes' expanded facilities . . . outlines 6-Point Coordinated Machine Tool Designing and Building Service.

**W. F. & JOHN BARNES COMPANY • 405 SOUTH WATER ST., ROCKFORD, ILLINOIS**

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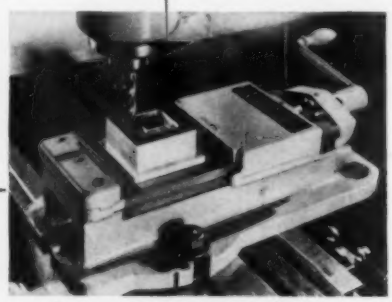
MACHINES • AUTOMATIC PROGRESS - THRU AND TRANSFER TYPE MACHINES

**Setup Time** **9 seconds**



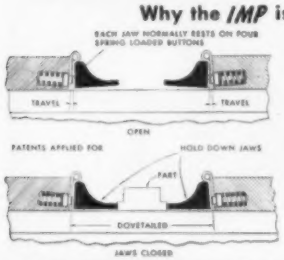
Nine seconds to setup this mold cavity operation with the IMP machine vise.

**No hammering, no parallels work is accurately seated**

**with the new *IMP* "HOLD-DOWN" vise**

The new IMP "HOLD-DOWN" vise has many *exclusive advantages* that can save you time, production costs and operations. Interchangeable jaws exert a downward force on the work while they are closing, thus holding work rigidly in place. Easy cleaning, no hammering or parallels, one hand operation and closer tolerances are all features of the new IMP. The IMP is perfect for surface grinding of non-ferrous parts, too!

**Why the *IMP* is different!**




Interchangeable hinged jaws exert a downward force on the work while closing. Work seats accurately without parallels.

See the new IMP at booth 1712 at ASTE show, March 19—23

**Thirty-Day Free Trial**

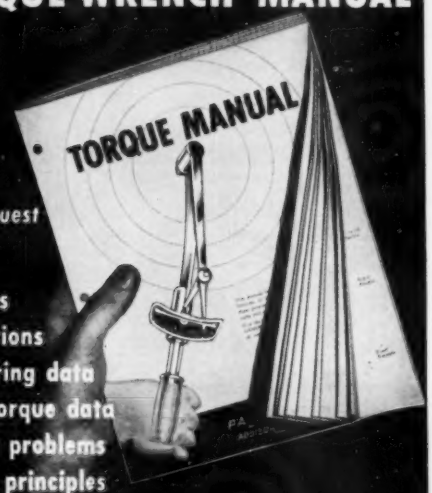
Try it in your shop for thirty days. If it isn't all we say it is, return it without obligation.

**Some sales territories still available to qualified firms.**

**ILLINOIS METAL PRODUCTS**
429 W. SUPERIOR ST. • CHICAGO 10, ILLINOIS
Phone: SUperior 7-3761-3762

USE READER SERVICE CARD; INDICATE A-3-504-1

**"TORQUE WRENCH" MANUAL**




*Sent upon request*

Formulas
Applications
Engineering data
Screw torque data
Adapter problems
General principles

**P.A. STURTEVANT CO.**
**ADDISON QUALITY® ILLINOIS**

Manufacturers of over 85% of the torque wrenches used in industry

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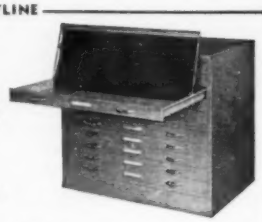
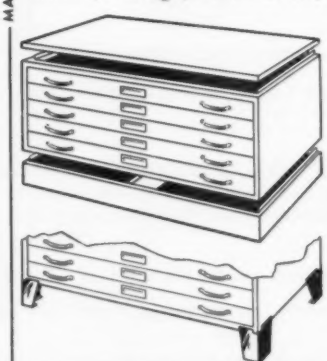
MAYLINE

**MAYLINE Steel Plan Files Meet Specifications**



Mayline Steel Blue Print Files meet present rigid government specifications, and in accordance with those specifications, the 5-drawer units, caps, and bases stack and intermember.

All Mayline drafting furniture and equipment will be on display at the ASTE Industrial Exposition, Amphitheatre, Chicago, March 19-23, in booth 1036.



MAYLINE

*Symbol of Superiority*

**MAYLINE CO.**
**611 No. Commerce St.**
**Sheboygan, Wisconsin**

MAYLINE MAYLINE MAYLINE

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## VALUABLE DIE-SET DATA FOR ALL TOOL ENGINEERS

It's easy-to-look-at! More than 200 pages are specially edited and arranged for quick and simple reference. Full color is used to make tables easier to read, illustrations more clear. The easy-to-look-at format plainly indicates all optional features. Covering the complete Danly "Leadership Line", this catalog presents full dimensional data and specifications for all Danly Die-Sets, Diemakers' Supplies, Bolster Plates and Bolster Plate Accessories. Get your copy of this new easy-to-look-at Danly catalog. *Write for it today.*

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**MORE COMPLETE DESIGN INFORMATION**

DANLY®
DIE SETS AND DIEMAKERS' SUPPLIES

WRITE FOR YOUR FREE COPY TODAY!

**DANLY MACHINE SPECIALTIES, INC.**
2100 South Laramie Ave., Dept. D, Chicago 50, Ill.

# *News from Hamilton!*

## 100 to 300 ton press line sets new standards

Here's Hamilton's brand new high-speed 250-ton, double-crank press with 60" x 36" bed and slide

For the first time in the industry, Hamilton gives you 100 to 300 ton presses built to meet exacting automotive production standards . . . standards pioneered in the automotive field through more than thirty years of Hamilton press leadership.

Every one of these 2-point, single acting, straight-side, double-crank presses is a brand new design. Each is engineered for constant top-speed, top-quality production—without profit-robbing downtime. Each is built for complete operating flexibility. Here are just a few of Hamilton's built-in extras that mean more operating profit for *you:*

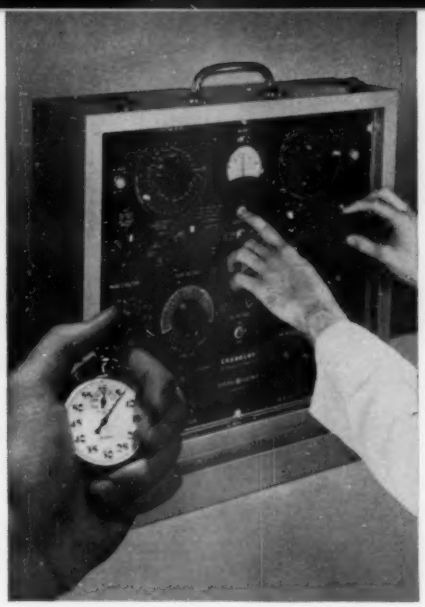
- rugged welded steel construction
- mechanically interlocked air clutch and brake
- barrel-type motorized slide adjustment
- automatic lubrication
- pneumatic flywheel brake
- die lights
- die cushions
- pneumatic counterbalances
- interlocked electrical clutch control

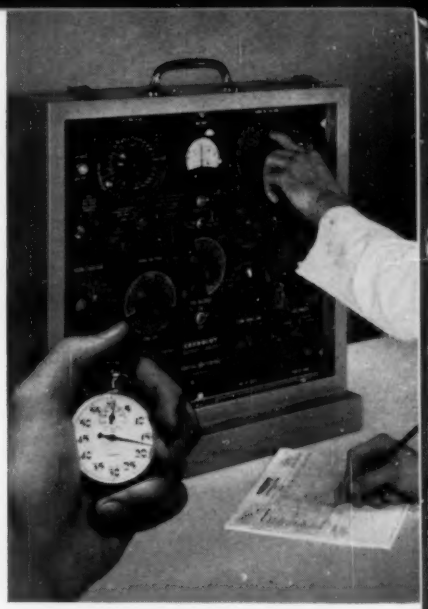
Exact specifications are adjustable to your individual requirements. Special electrical controls are available to meet particular electrical standards.

It will mean money in your pocket to find out today how these all-new Hamilton presses can help you turn out high quality stampings fast . . . without costly production downtime. Get the full story on these new standards for 100 to 300 ton presses . . . from Hamilton Division, BLH Corporation, Hamilton, Ohio.

BALDWIN · BLH · LIMA-HAMILTON

**HAMILTON DIVISION**
**BALDWIN-LIMA-HAMILTON**
DIVISIONS: Austin-Western • Eddystone • Electronics & Instrumentation • Lima • Loewy-Hydropress • Madsen • Pelton • Standard Steel Works





Set dials for the values of each of the known variables. (Time: 1-2 minutes.)

Turn dial of unknown variable until meter balances at zero setting. (Time: 10-15 secs.)

Read the answer directly off the dial. No computations are necessary. (Time: 10 secs.)

# SOLVE MACHINING PROBLEMS IN SECONDS WITH CARBOLOY MACHINABILITY COMPUTER

- **Calculate production, tool life, horsepower, or any of 16 other basic machining variables**
- **Eliminate wasteful tryout runs, improve existing setups**

The Carboloy® Machinability Computer is a new engineering tool designed to solve complex machine setup problems in seconds, instead of hours.

It calculates the effect of the 19 most critical machining variables on the material to be cut, the cutting tool, and the cutting conditions . . . shows how to set up optimum operating conditions for any metal-cutting job, and how to improve existing setups by the right variation of operating conditions.

### For production men, methods men, etc.

The Computer assists production men by determining rate of metal removal, and by immediately showing how production is affected by changes in feed, speed, depth of cut, tool material, and other key variables.

It will eliminate wasteful, nonproductive trial runs, saving valuable stock and setup time. It also determines machine output for methods men, pieces per hour for estimators, and it answers other problems pertaining to machining . . . providing accurate solutions in seconds for problems that normally take hours.

### Easy to use

The Carboloy Machinability Computer is easy to operate. Anyone with machining experience can use it after a short familiarization period.

The computer is portable (weighs only 32 lbs.), battery-operated, and measures 21″ x 7″ x 20″. Price: $495, f.o.b. factory, Detroit.

Whether your plant is large or small, the Carboloy Machinability Computer can pay for itself by increasing production, reducing manpower costs. Send the coupon on page 4 of this advertisement for full details. We will arrange a demonstration in your plant.

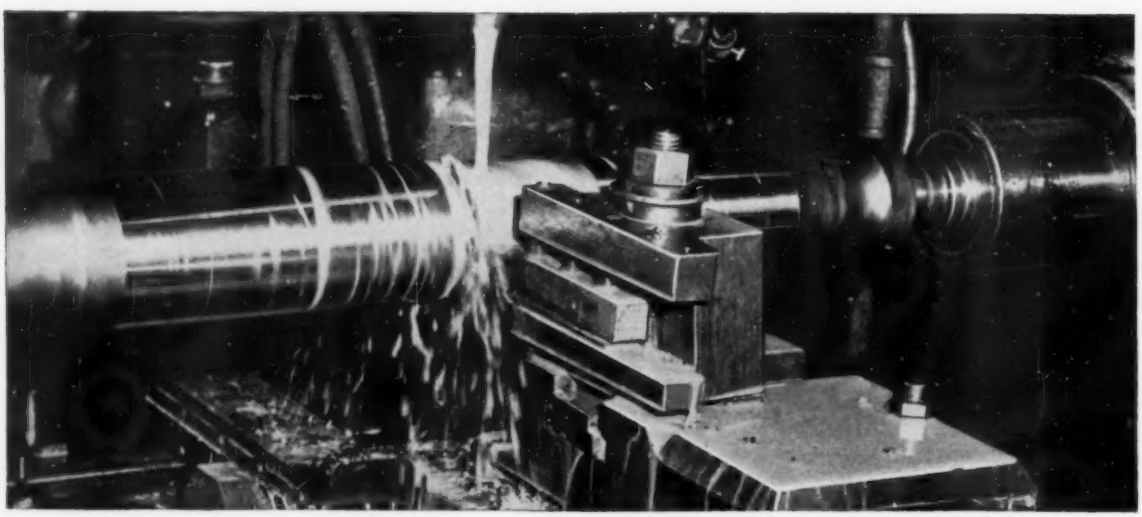
**CARBOLOY**

DEPARTMENT OF GENERAL ELECTRIC COMPANY

**TURNING AND FACING TURBINE WHEEL HUBS.** Before Grade 370, a 12-inch Fay Automatic (pictured on opposite page) required more than five minutes to drill, turn, and face the rough Inconel X forging (shown at top, left) . . . and the machine was shut down half the time because tools required constant regrinding. Here are the results after Kelsey-Hayes Wheel Company switched to Carboloy Grade 370: machining time per piece cut 40%; production and tool life almost doubled; downtime drastically reduced; finish improved (shown at bottom, right).

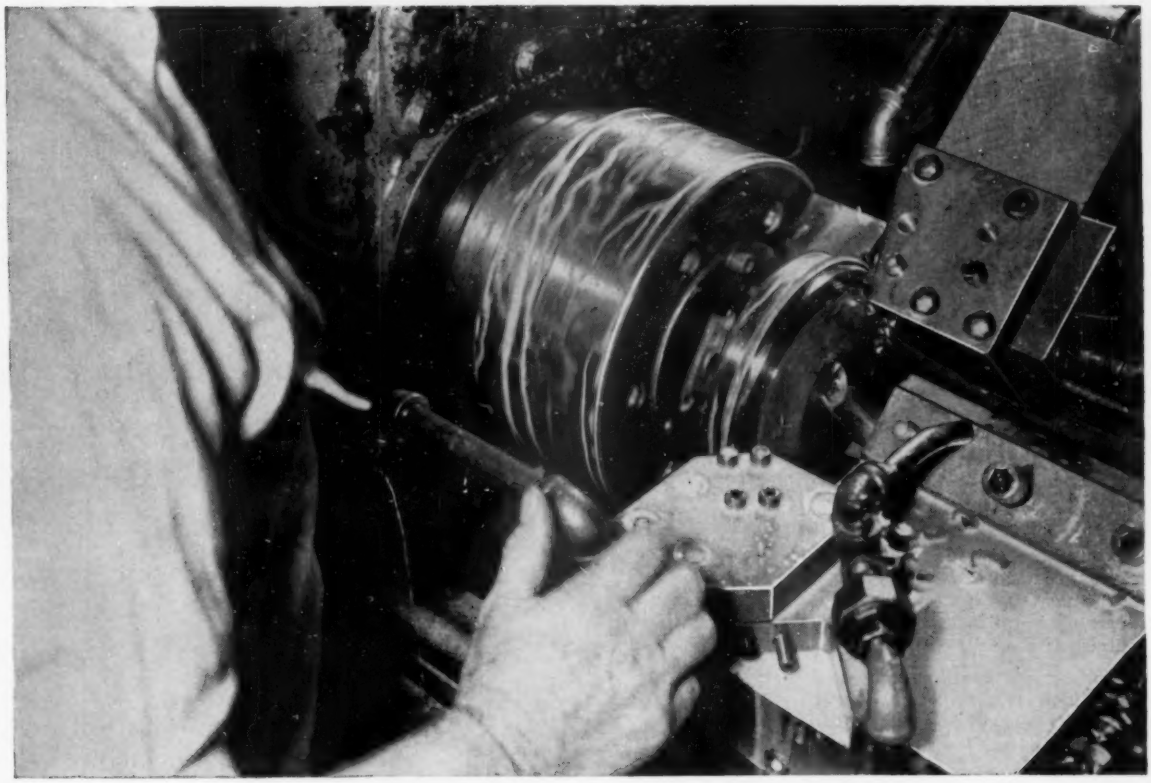
**SETUP: Material** – Rough Inconel X forging. **Speed** – 100 sfpm. **Feed** – 0.144 inch. **Depth of cut**–3/16 inch. **Coolant**–Yes.

# CUT MORE STEEL PER MINUTE WITH CARBOLOY



**TURNING LANDING-GEAR PISTON.** With regular carbides, Menasco Mfg. Co. was getting only one part per tool grind, with the job running at 170 sfpm. With Grade 350, speed was stepped up to 227 sfpm, tool life increased 6 to 1, and machine downtime decreased.

**SETUP: Material** – 4340 forged steel, heat-treated to 46 Rockwell "C." **Speed** – 227 sfpm. **Feed** – 0.010 inch. **Depth of cut** – 0.060-0.200 inch. **Coolant** – Yes.



# EXTRA-PERFORMANCE GRADES 350 AND 370

- **Take heavier, deeper cuts without tip deformation**
- **Increase production up to 300% over other carbides**

Machining records in plant after plant show Carboloy Grades 350 and 370 consistently outperform conventional carbides . . . and far outwear them on the toughest jobs.

These grades cut more steel per minute, give more production per tool, increase machine efficiency. They outwear all other steel-cutting carbides, with less downtime for tool changes, and lower cost per piece.

### Built-in structural rigidity

Carboloy Grades 350 and 370 are extra-performance carbides. Their superiority is due to the greater structural rigidity built-in by the Carboloy manufacturing process.

This process enables them to take deep, punishing cuts without the chipping, cracking, or cratering encountered in other carbides . . . even at temperatures as high as 1800° F.

### No "equivalent grades"

Try heavy-duty Grade 370 and medium-duty Grade 350 . . . compare them with ordinary carbides on the toughest jobs. See why there are no "equivalent grades" to Carboloy 350 and 370.

Authorized Carboloy Distributors stock a complete line of Grade 350 and 370 tools, blanks, and inserts. Call them today; or for more information on these extra-performance carbides, send the coupon on page 4 of this advertisement.

**CARBOLOY**
DEPARTMENT OF GENERAL ELECTRIC COMPANY

# CUT INDEXING TIME AND INSERT COSTS WITH EASIER-TO-USE CARBOLOY TOOLHOLDERS

- **Single screw indexes insert; automatically sets chipbreaker**
- **Carbide pad absorbs shocks; cuts throw-away insert costs**
- **New design reduces overhang; improves tool accuracy**

By simply adjusting a single screw at the top of the shank, the blank can be indexed while the Carboloy holder stays in the machine. The carbide chipbreaker is set automatically in the correct position.

### Carbide pad cuts insert costs

Because the carbide pad absorbs shocks and gives greater rigidity, thinner, harder, more economical cutting blanks can be used. Machines operate at greater speeds and feeds; increase output at reduced cost.

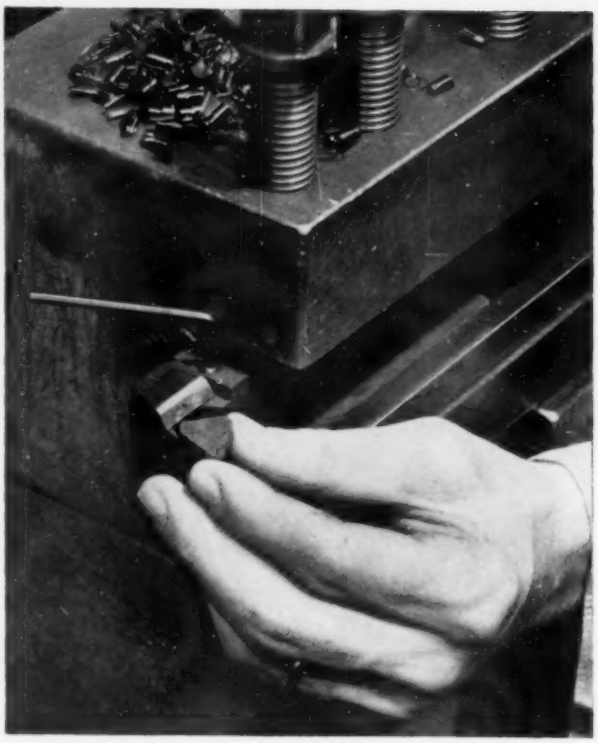
Carboloy design eliminates projections below the shank . . . reduces overhang, increases accuracy and rigidity. Minimum projection above the shank stops chip interference, protects clamp from abrasive chips.

Heat-treated shanks give the holders extra strength to resist deformation and chip wear.

### Handle special jobs with ease

The Carboloy holder design is quickly adaptable to "specials" with cutting angles other than standard, and to positive or neutral rakes. New, compact design makes them especially efficient for gang tooling.

Available for round, square, or triangular blanks, the Carboloy holders are stocked in 7 styles and 52 sizes. New, heavy-duty holders are also available. For prices and specifications, send the coupon today.



New Carboloy Toolholders can be indexed quickly and easily . . . right in the machine. Chipbreaker is set automatically.

**CARBOLOY**

DEPARTMENT OF GENERAL ELECTRIC COMPANY

**11101 E. 8 Mile Road, Detroit 32, Michigan**

Send me information on these Carboloy products:

- ☐ Carboloy Machinability Computer
- ☐ Grades 350 and 370 steel-cutting carbides
- ☐ Carboloy Toolholders

Also:

- ☐ Have a representative make an appointment to demonstrate the computer
- ☐ Send the name of the nearest Authorized Carboloy Distributor

Name _____

Title _____

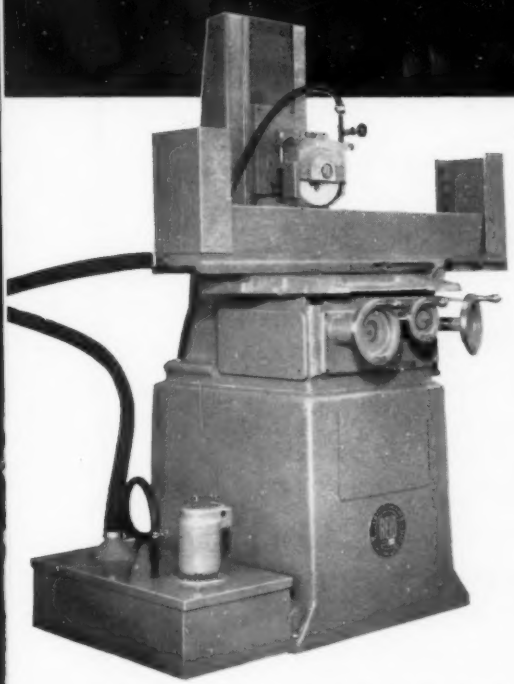
Company _____

Address _____

City _____ Zone ____ State _____

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

# REID sets the standard for precision surface grinding...



**MODEL 618H** convenient finger-tip level controls for all operations make this grinder the favorite of the toolroom for the finest tool and die grinding. Accessories, including Cool-Grind or wet grinding attachments, magnetic chucks and form dressers give extreme versatility for all operations.

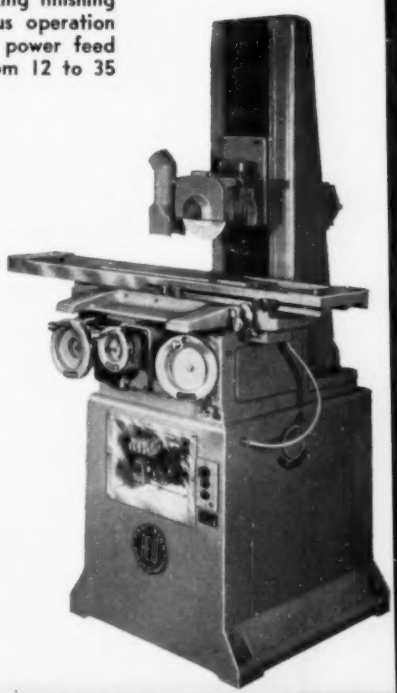
**MODEL 618VL** designed for precision grinding to the finest tolerances with superior surface finish . . . rugged construction and painstaking finishing give true dependability for continuous operation with minimum maintenance. Features power feed table with traverse speed variable from 12 to 35 feet per minute.

## SPECIFICATIONS

**CAPACITY:** 6" wide, 18" long, 17¼" high from spindle center to table.
**WORKTABLE:** 51" x 8" overall.
**FEED RANGE:** Elevating hand wheel (r.) graduated to .0005" (optional, vernier to .0001"); cross feed to .001"; power cross feed adjustable .006" to .100" at either or both ends of table reverse.
**GRINDING HEAD:** with 3" opening for standard 1 h.p. cartridge type motorized spindle. Wheel size: 7" x ½" x 1¼".
**FLOOR SPACE:** 71" x 43½"
**WEIGHT:** 2100 lbs. net

*Write for Bulletin 618-15*

*Photo courtesy o Robertson Mfg., C*



**Reid Brothers Company, Inc.**
BEVERLY MASSACHUSETTS

# DOES IT TAKE MORE THAN 8,000 HOURS TO TRAIN A TOOL & DIE MAKER?

And could any thing or any service ever get produced without his higher skills?

So he's a production personage; he rates the right steel in the right size at the right time—fine tool steel completely made-ready for his layout bench.

Consider, then, the advantages of **Warplis** . . .

***The steel***—oil hardening, non-warping, electric furnace tool steel of this well-known, perfectly balanced composition:

C. .90 Mn. 1.10 Cr. .50 Tung. .50 Va. .15

. . . unsurpassed for ease of working, for safe hardening without appreciable warpage or dimensional change, for fine performance.

***The preparation***—all sections, flats, squares and rounds, are ground—precision ground by improved techniques—and dimensionally true, with smooth, flawless, decarb-free surface.

***The scope***—651 standard sizes of flats and squares in 18" lengths; 180 standard sizes of rounds in 36" lengths.

***The producer***—Pittsburgh Tool Steel Wire Co., Monaca, Pa., leading specialists in cold finished fine steels for 54 years.

Procedures may be simplified . . . guess-work removed . . . confusion avoided . . . quality controlled . . . time and money saved . . . by standardizing on this one single grade—at no premium price—for finer tools and dies, and for precision parts, too.

The name to remember is **Warplis** . . . Warplis Ground Flat Stock (flats up to 2" thick and 14" wide; squares up to 4") and Warplis Drill Rods (rounds up to 2"). Available from selected distributors coast-to-coast, or write "Pittsburgh" for descriptive size and price folders.

**PITTSBURGH TOOL STEEL WIRE CO. · MONACA, PA.**

*Since 1902 . . . makers of cold finished fine steels in all sizes, grades and shapes*

# What's New In Cylinders and Valves?

VISIT BOOTH 366, A.S.T.E. SHOW—CHICAGO, MARCH 19-23

for

*Exacting*

CYLINDER CONTROL

### ¼" UNITITE JR. VALVES

Hanna ¼" Valves control air, oil or water pressures up to 500 p.s.i. The control lever requires only 80° movement for reversal. Hanna ¼" Valves are 4-way but can be made 3-way, by plugging one port. Three models — column, standard and manifold mount—are available. Ideal for tubing and light piping.

### ELECTRIC VALVES

The Hanna 4-way Solenoid Valve is small, compact, with low current consumption. It is adaptable to straight line piping—capacity is equal to rated pipe size. Of balanced spool type, it has a built-in solenoid pilot valve. Piping may be from bottom, sides or a combination. Available in ⅜", ½", ¾" and 1" pipe sizes.

# Hanna® valves

CHOOSE FROM a broad selection of Hanna Valves to meet your requirements for exacting Air and Hydraulic control. Illustrated are but a few of the complete line of hand, foot, electric and pilot operated valves for directional and speed control. They all carry the Hanna nameplate—an assurance of extraordinary care in design and manufacture—which means years of maintenance-free operation. Your Hanna sales representative offers specialized experience in selecting valve combinations and developing control circuits.

***Send for Catalog***

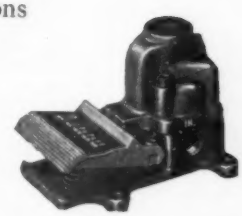
Hanna Valve Catalog No. 254 includes descriptions and specifications on the complete line.

### SPEED CONTROL VALVES

Hanna Flo-Set Valves have micrometer graduations to assure exacting speed control. Available in ¼", ⅜", ½" and ¾" sizes, they are suitable for air, oil or water control, with maximum pressure to 250 p.s.i. They may be mounted in any position.

### UNITITE VALVES

Unitite Valves are suitable as either 3-way or 4-way valves, operating at air, oil or water pressures up to 250 p.s.i. for the ⅜", ½", and ¾" sizes . . . up to 150 p.s.i. for the 1" size . . . and up to 100 p.s.i. for the 1¼" size. Three styles—for standard mounting, column mounting or manifold mounting—are available.



### FOOT OPERATED VALVES

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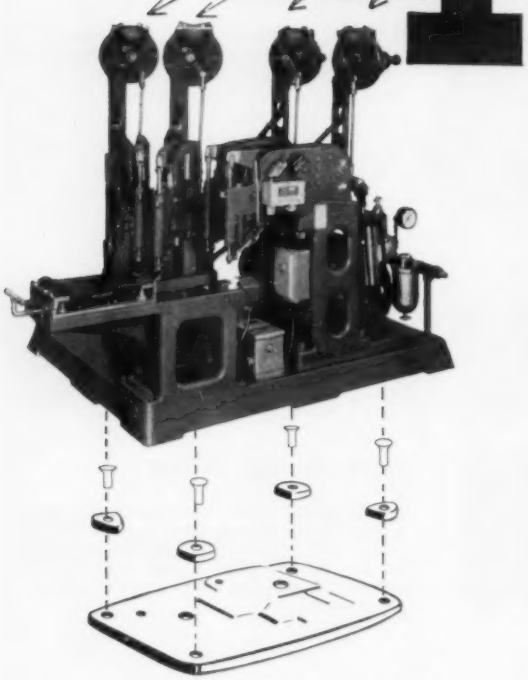

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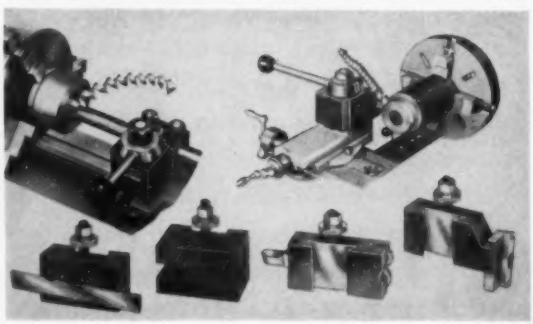

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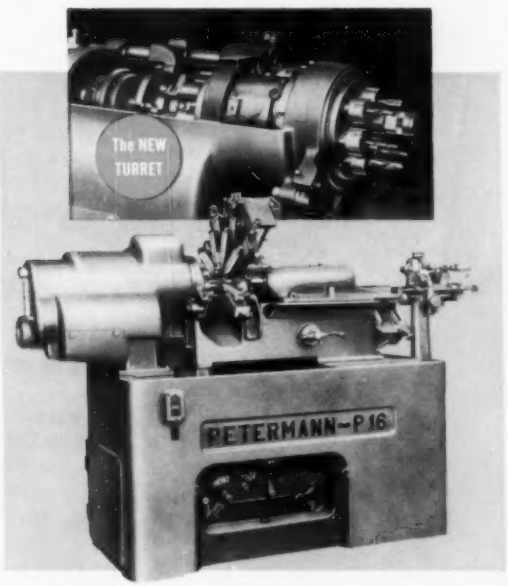


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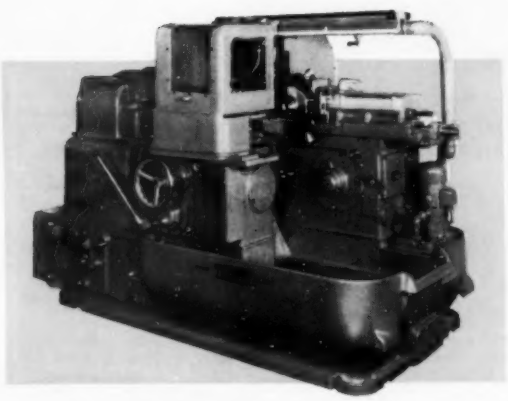

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An invitation for technical papers has been extended by the National Program Committee of the American Society of Tool Engineers. The papers are for presentation at the 25th (Silver Anniversary) Annual Convention of the ASTE, being held in April 1957.

ASTE membership is not required for submission of a paper. Additional papers will be accepted for consideration until May 1, 1956. Each proposal should include an outline of the paper, the author's name, title and affiliation.

Authors must also agree to abide by the published rules for presentation of papers before a national meeting of the ASTE.

Outlines should be sent to:

L. S. Fletcher
Program Director
American Society of Tool Engineers
10700 Puritan Avenue
Detroit 38, Michigan

Authors of accepted papers will be notified by June 15, 1956.

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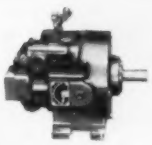

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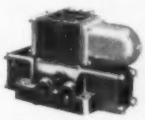

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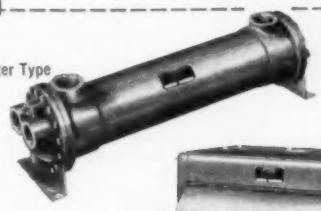

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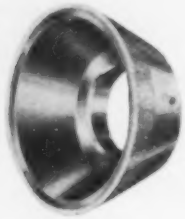

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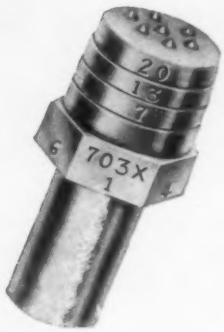


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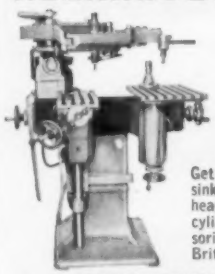

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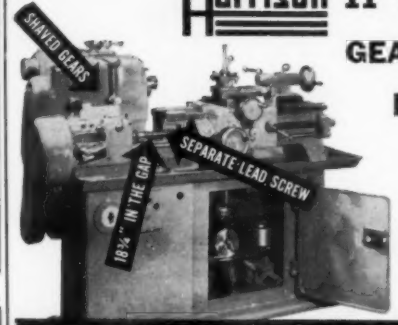


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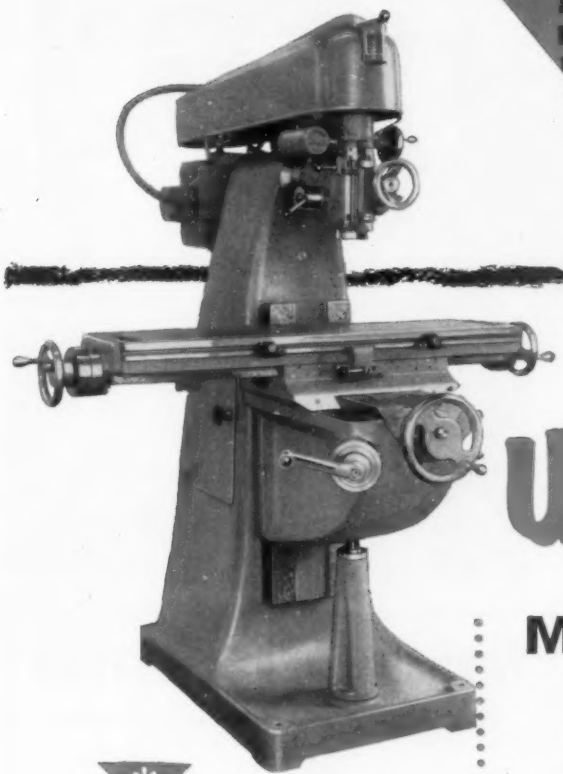

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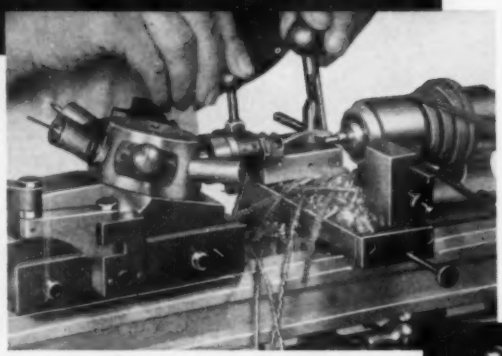

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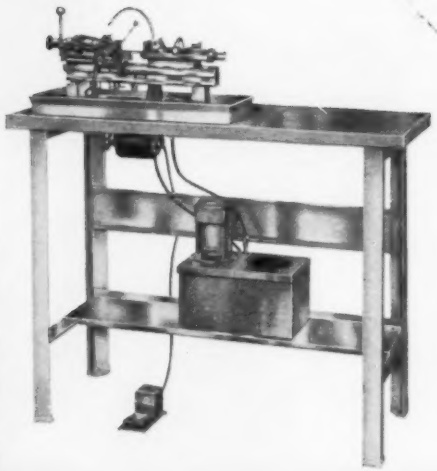

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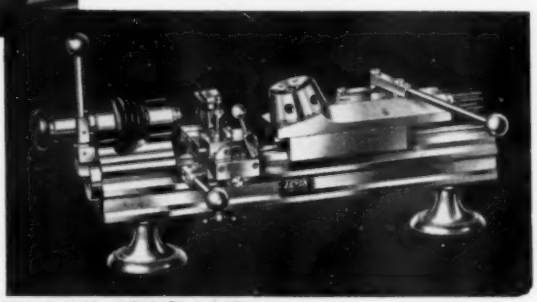

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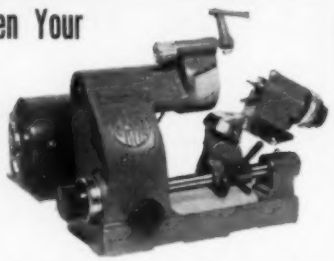

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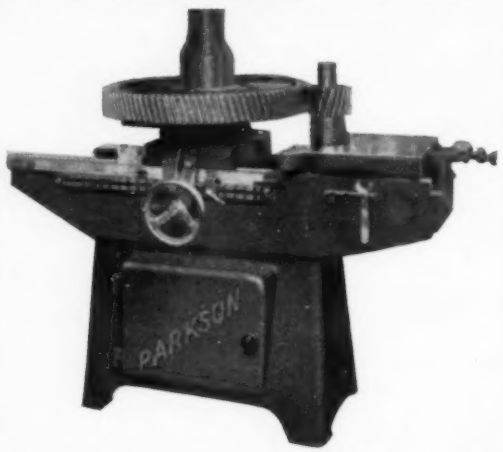


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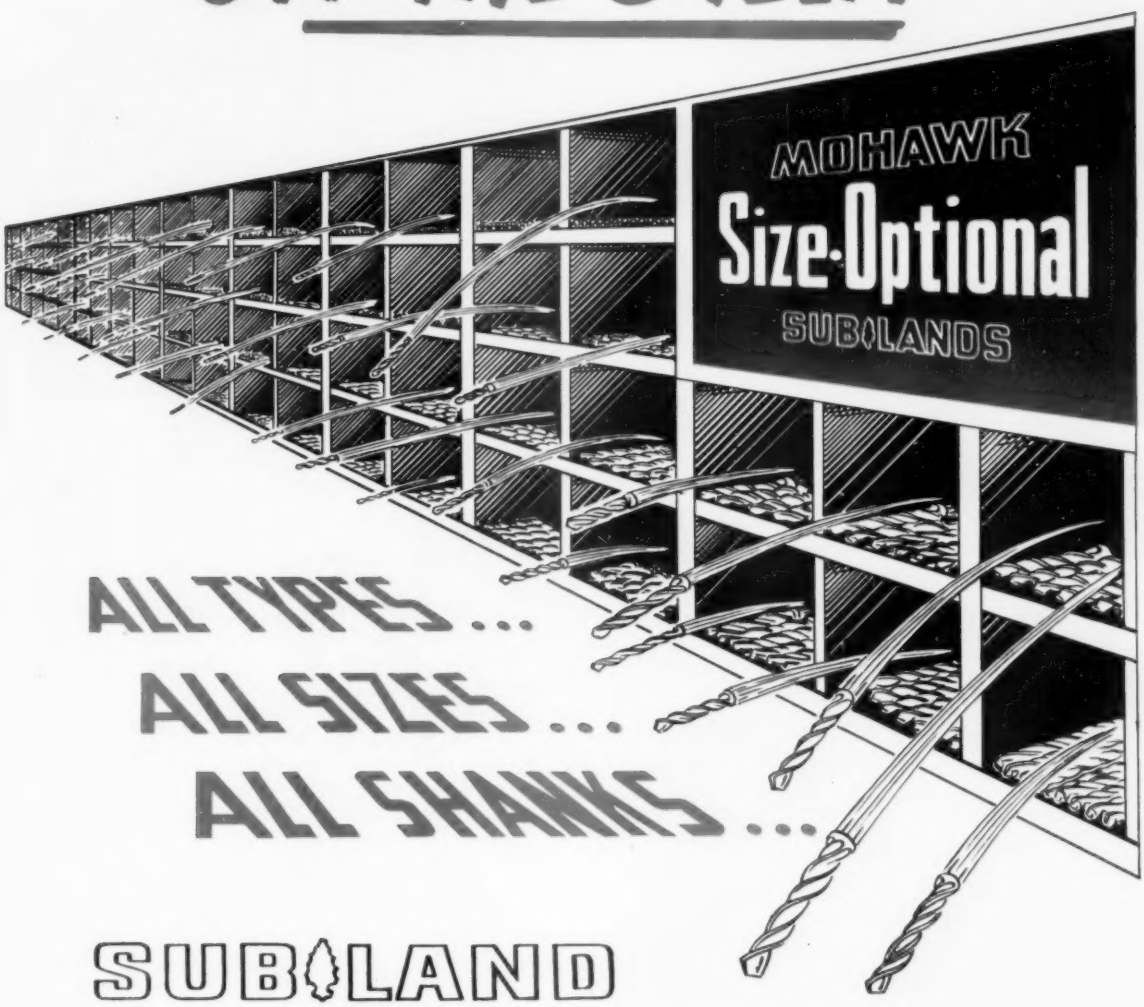


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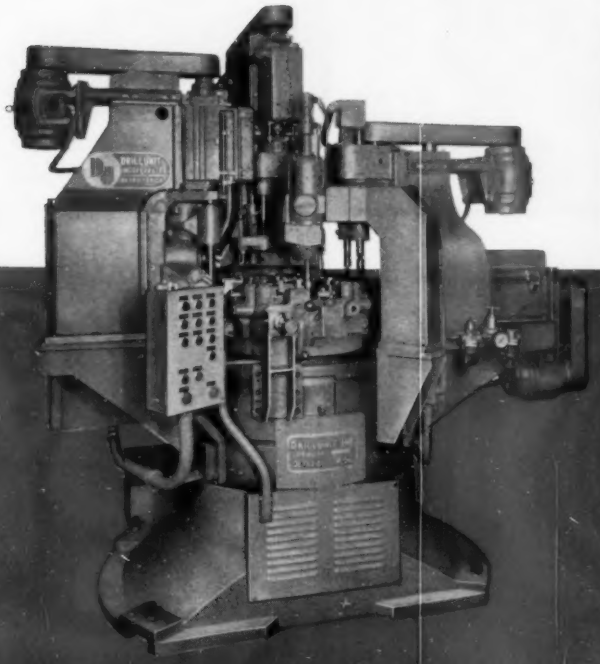

This machine mills, drills, reams, counterbores, spot faces and taps.

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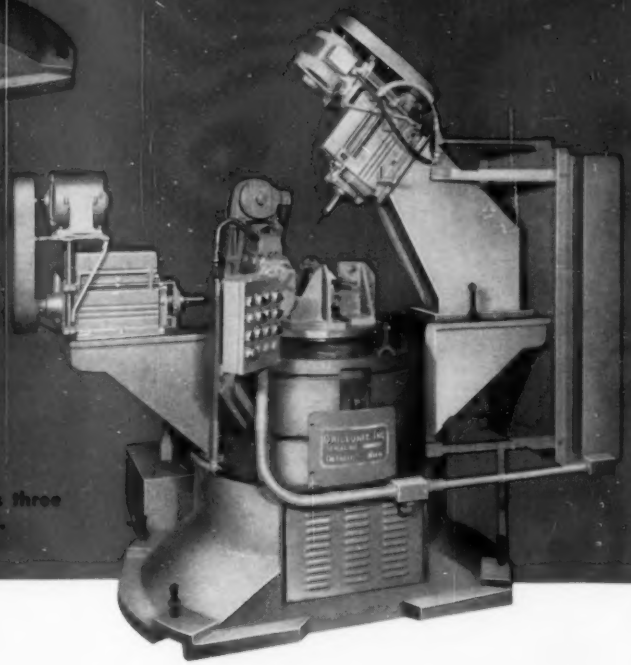

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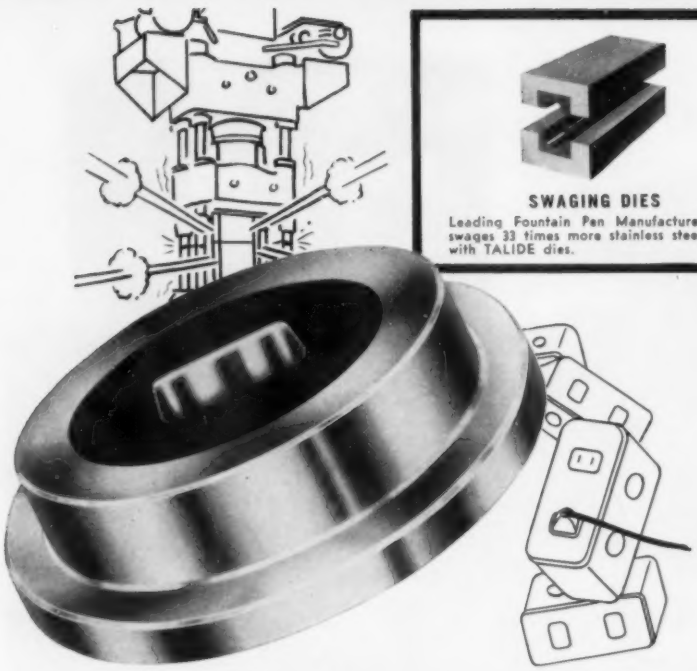



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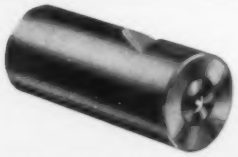

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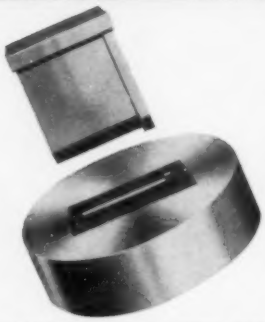

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70 times more paper discs blanked out with TALIDE — over hard alloy die.

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137,000 hi-alloy steel Pressure Vessels drawn with TALIDE, against only 7,900 with steel dies previously used.

**POWDERED METALLURGY DIES**

Compacting highly abrasive chemical powders, TALIDE Pill dies last 4 months, steel dies wore out in 6 hours.

# 25,680,000 PARTS PRODUCED with ONE TALIDE DIE

A large electrical equipment manufacturer was having difficulty maintaining production of electrical outlet boxes. Die costs were high, downtime and scrap excessive. It was necessary to remove and repolish the hi-carbon, hi-chrome die every 60,000 pieces. Total production secured from each steel die averaged 700,000 pieces.

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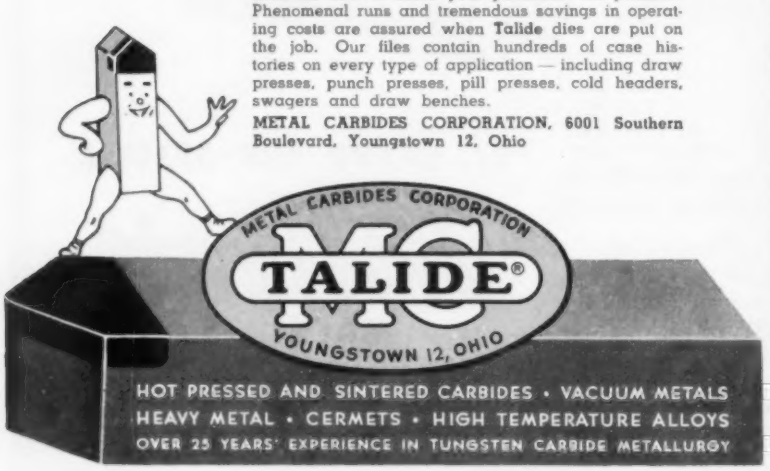
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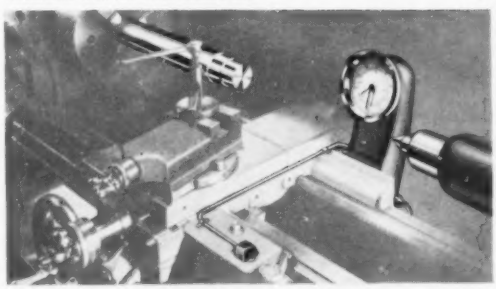

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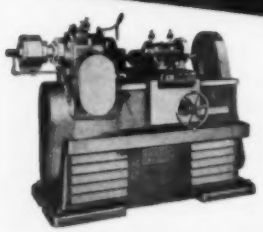
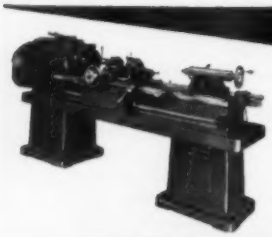


"H1" Completely automatic for precision internal and external right and left hand threads, 4 to 50 per inch. Internal: ⅝" to 8". External: 3/16" to 7".



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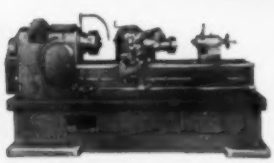

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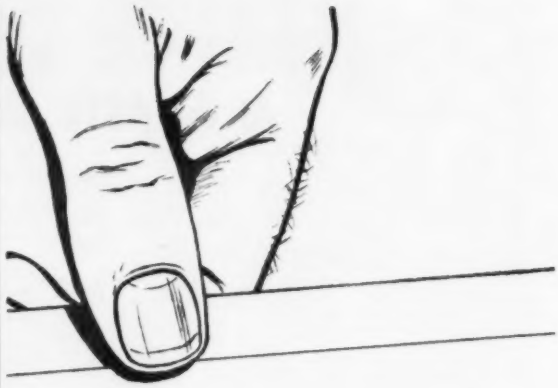

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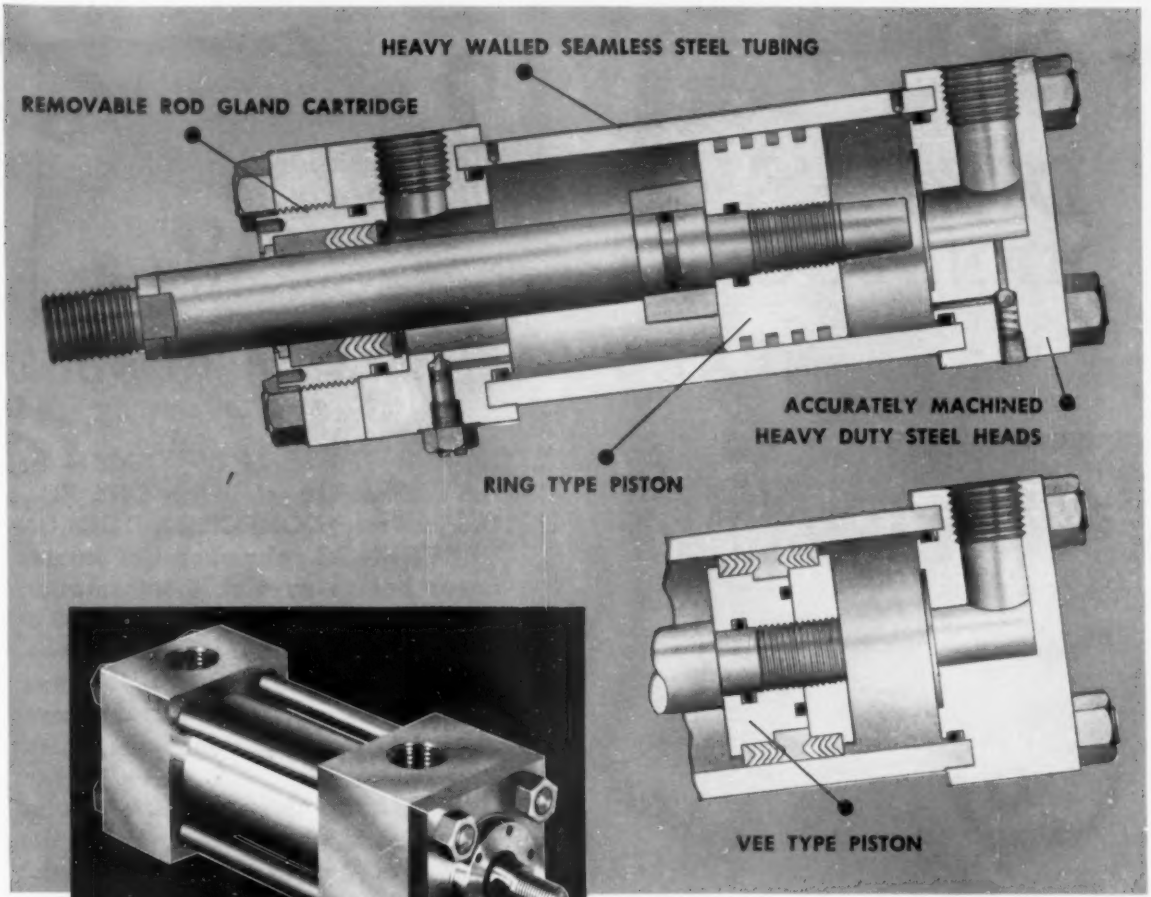


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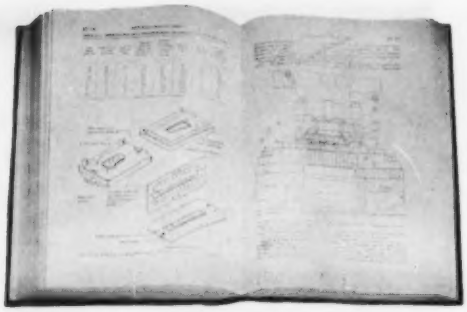

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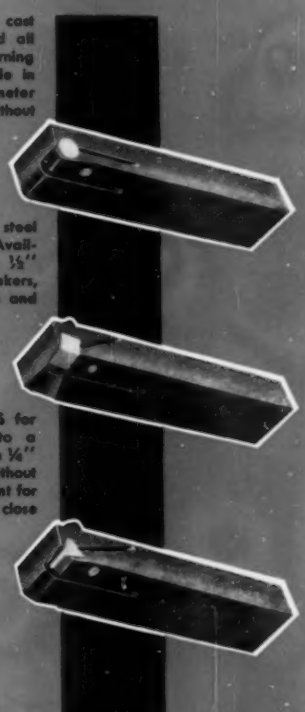

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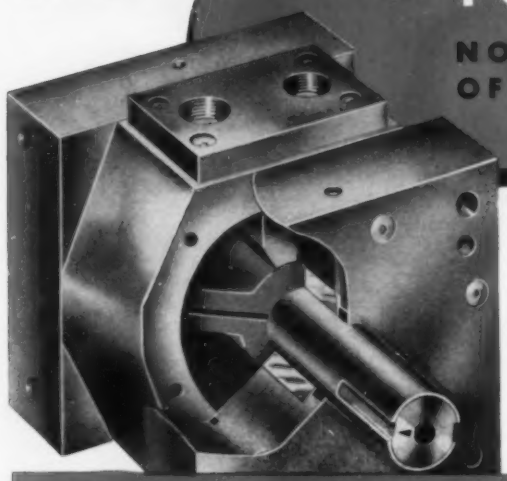

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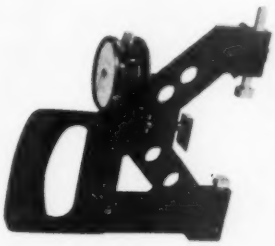

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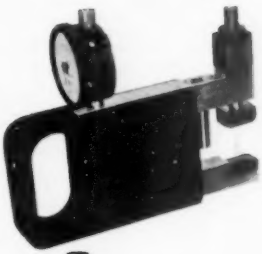

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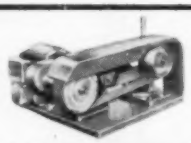
For all-around use or as low-priced auxiliary to larger machine tools.

**Model B3 DRY BELT GRINDER**

Used mainly for free-hand grinding and light stock removal.



**Model BB5 BENCH GRINDER**

Does clean-up, deburring. Removes flashings, risers, etc.

**Model 505 BACKSTAND IDLER**

Combines high production speed with automatic belt tension economy.

**Model AB5 BACKSTAND IDLER**

Converts grinding-polishing lathes to high output belt grinders.

**Model CN2 UTILITY GRINDER**

Grinds on contact wheel, platen or free belt — horizontal or vertical.

THE ENGELBERG
188 SENECA STREET,

# conveyor-type BELT GRINDER!

## GENERAL DESCRIPTION

A high-production, semi-automatic, abrasive belt machine for wet or dry grinding or polishing of ferrous or non-ferrous parts, plastics and other materials.

## SPECIAL FEATURES

- Conveyor belt changed in less than 5 min.
- Conveyor belt tension adjusted by simple twist of handle
- Conveyor belt speed varied and set by quick, easy turn of a wheel
- Extra safety — machine won't start unless belt is tensioned

Easily set belt tension remains constant, can be adjusted as desired. Notice simplicity and ease of belt change.

## SPECIFICATIONS

**Overall Size**—90″ long x 51″ wide x 90″ high
**Abrasive Belt Size**—6″ x 80″
**Conveyor Belt Size**—7″ x 144″
**Abrasive Belt Speed**—5500 sfpm
**Conveyor Belt Speed**—variable from 5 to 30 fpm
**Maximum Piece Capacity**—4″ high, 6″ wide, any length

**OPTIONAL ARRANGEMENTS**

- Single, double or any number of heads
- 5 or 7½ hp drives
- With or without magnetic chuck

**HULLER CO. Inc.**
SYRACUSE, NEW YORK

Send us sample piece or print for cost—and time-savings estimate via the abrasive belt grinding way. Or ask to have one of our production engineers call to discuss your grinding problems. No charge—no obligation. Write for catalog.

**IRD** Balance: *final dimension of precision*

## For Grinding—Higher Production and Chatter-free Quality

IRD Analyzers did this for Timken Roller Bearing Company:

1. Cut unproductive downtime for wheel balancing by 600%.
2. Eliminated grinder chatter—no chatter rejects.
3. Decreased troubleshooting time by pinpointing *all* the causes of chatter.

What's more, in-place electronic wheel-balancing eliminated removing the grinding wheel from the machine—cutting wheel balancing time from 3 hours to less than 20 minutes. Not only do IRD Vibration Analyzers locate and correct trouble in grinding wheels, but in accessory components such as spindles, motors, belts, gears and hydraulic systems. The IRD Analyzers are portable for troubleshooting and in-place balancing... *at running speed.* Now, no grinding machine at Timken exceeds the permissible vibration tolerance of .000090 inches.

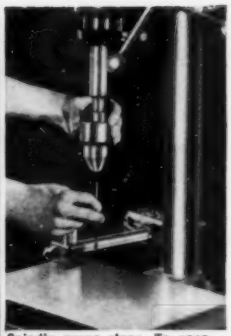
What IRD troubleshooting equipment is doing for Timken, it can do for your company's production equipment... for any machine tool, or for fans, pumps, motors, turbines, generators... machinery of *any* size that has rotating parts.

Why not have an IRD representative call on you to demonstrate the possibilities of obtaining IRD Balance—final dimension of precision—on your machines?

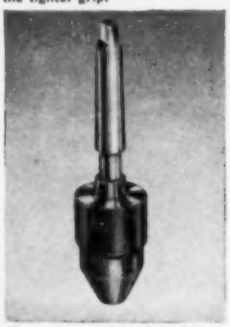
**IRD**
*vibration analyzers*

**International Research and Development corp.**
801 thomas lane, columbus, ohio

USE READER SERVICE CARD; INDICATE A-3-536-1



Spindle never stops. To open—pull down. Jaws open automatically, release tool. To close—insert new tool. It's locked and centered. The greater the load, the tighter grip.



Model A—capacities from ¼" to ⅜" and ⅛" to ½" available with Nos. 1, 2 and 3 Morse Taper Shanks and Taper Adapters.

## CHANGE TOOLS IN SECONDS, SAFELY!

**Drill, ream, counterbore with one spindle, without stopping spindle or moving work.**

No keys, collets or wrenches are needed on Wahlstrom Fully Automatic Chucks and Tapping Attachments. Tool is automatically centered. Grip can't slip or chew tool shank. Wahlstrom Chucks convert 95% of lost tool changing time to productive time. And, a single Wahlstrom Chuck does the work of several spindles. Write for spec. folder and distributor name. Wahlstrom Chucks—made by the makers of the Float-Lock Industrial Vise.

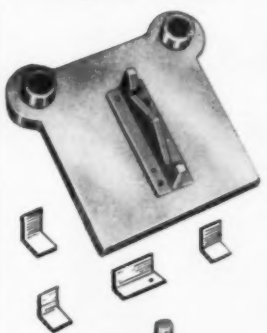
*See us at Booth 153, ASTE Show

Another AMF Product
**WAHLSTROM AUTOMATIC CHUCKS**
**AMF TOOL DIVISION**
AMERICAN MACHINE & FOUNDRY COMPANY
224 Glenwood Avenue, Bloomfield, New Jersey

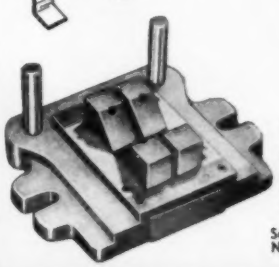
USE READER SERVICE CARD; INDICATE A-3-536-2

**Punches and Dies**

## Angle Iron Cut Off Die



No. 18, cut off die, for 2"x2"x¼" and lighter angles. Mounted in leader pin die set. Fits most all makes of 25-ton and larger presses. Simple shearing action insures straight, clean cut WITHOUT DISTORTION. Another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Also adaptors and die shoes to convert your press. Each precision-made.



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Send for free illustrated catalog No. 154 AC. Net prices shown.

**WARD Machinery Co.** 564 West Washington **Chicago 6**

USE READER SERVICE CARD; INDICATE A-3-536-3

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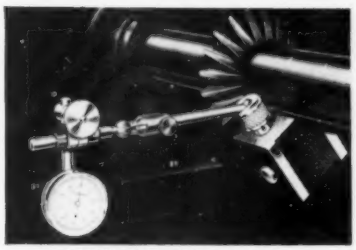
No. 483 and No. 485 measure 3 or 5-fluted cutting tools. Read direct in thousandths, eliminate special fixtures. Satin Chrome Finish with carbide facings on anvil and spindle.



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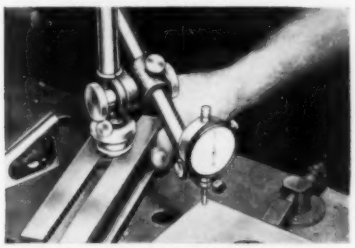
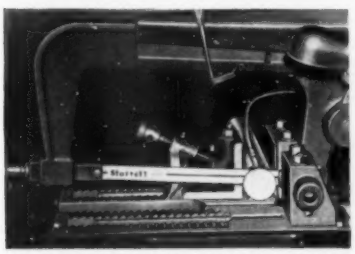
**NEW STAINLESS STEEL RADIUS GAGES**

No. 167. Sets of individual gages, each with five gaging surfaces for convex or concave radii. Made of rustproof stainless steel with Satin Finish. Six convenient sets.



**NEW DIAL TEST INDICATORS**

like this No. 675 simplify layout, production and inspection. And don't forget the complete new line of Starrett high precision-low friction dial indicators.



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March 1956 Issue

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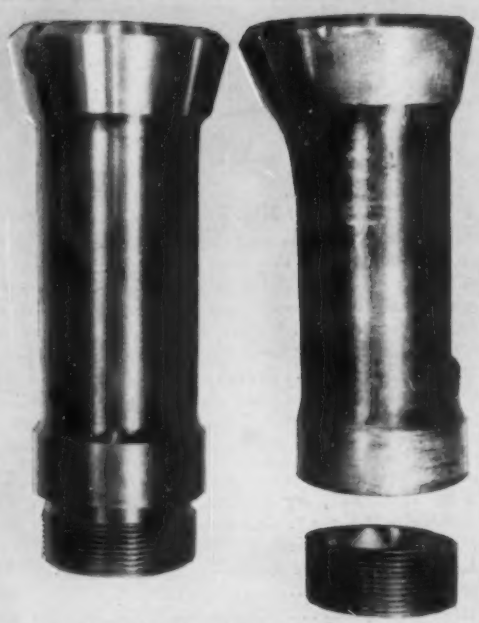
# BENCO COLLETS



At right is a collet from a 1" machine. Note the threads are twisted off. Think about the trouble this caused besides the loss of time and production.

This will not happen to the Benco Collet shown at left. It's correctly engineered and carefully made. Remember Benco Collets are guaranteed against breakage for one year.

**will not break off at the threads**

**will not run out more than .001 per inch**

**or your money back**

Tests prove that the unique design of Benco Collets and our specialized manufacturing processes prevent two most common causes of collet trouble. Benco Collets are guaranteed against breakage for one year.

Benco Collets have threads with a tensile strength in excess of 175,000 pounds per square inch. These collets are made of high carbon alloy tool steel, not carburized steel. Precise manufacturing controls insure a guaranteed accuracy of .001 run-out per inch of bar extension from the face of the collet.

Even with all their extra features and guarantee, Benco Collets cost you no more than just ordinary collets. You get maximum satisfaction... you save time, money and grief by using Benco Collets. Select them every time, you can't get better quality, performance or value.

* BENCO MAKES: Master Pushers and Pads • Master Collets and Pads • Pushers and Feed Fingers • Conventional Collets • Ejector Collets • Collet Sleeves and Chuck Nuts for B. & S. Machines • Carbide Faced Stock Stops for B. & S. Machines.

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Cleveland 14, Ohio

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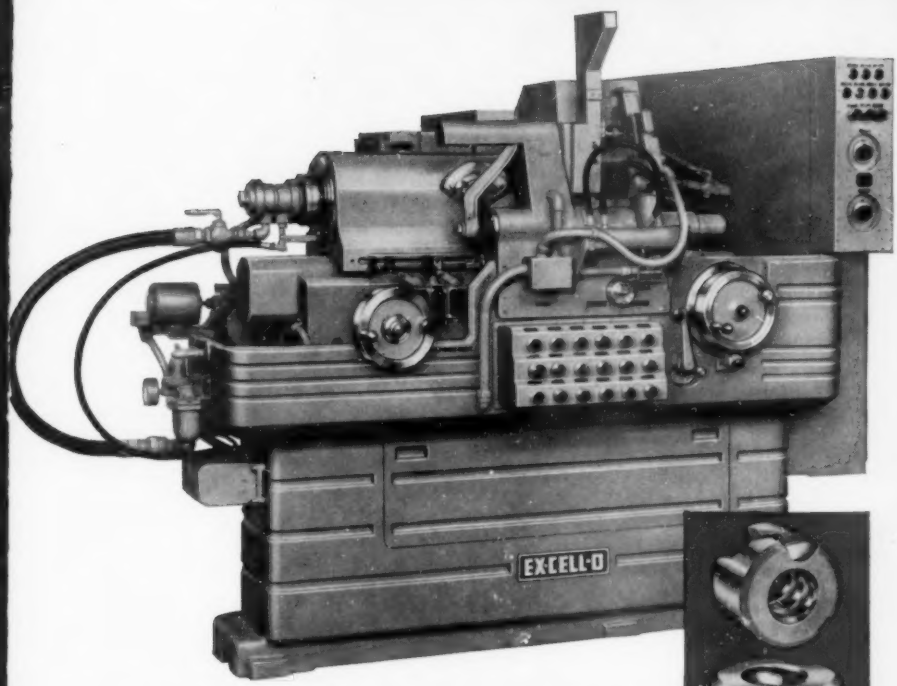
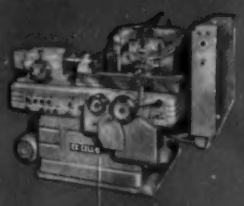



Ex-Cell-O Style 39-A Precision Internal Thread Grinder equipped with automatic work handling equipment. This machine loads, locates, grinds threads and ejects steering gear ball nuts in a completely automatic cycle.

# EX-CELL-O Thread Grinders

## Manual – Automatic – Automated



**EX-CELL-O STYLE 33 FOR EXTERNAL THREADS:** An accurate production machine, automatic except for loading, unloading, and moving the cycle lever. Can be arranged for tapered grinding and for eccentric relief grinding.

**EX-CELL-O STYLE 36 FOR LONG EXTERNAL THREADS,** also available with internal attachment. A high production machine with easily adjusted work cycles.

**EX-CELL-O STYLE 50:** A versatile machine for external work . . . also available with internal attachment.

**EX-CELL-O STYLE 120:** Our largest Thread Grinder. Grinds 10 feet of thread in one setting. Accommodates 12 feet of stock between centers.

These standard machines are grinding thread gages, machine tool lead screws, innumerable aircraft parts, automotive steering mechanisms and pinions, worms, taps, and many similar workpieces.

Precision thread grinders in this Ex-Cell-O line range from manually-operated models, for toolroom and for short runs, to high production automatics, to styles equipped with automatic work handling equipment. There are five models designed to meet your every requirement.

For specific information on thread grinder operations or a quotation on a machine for your requirements, call your local Ex-Cell-O representative or write Ex-Cell-O in Detroit.

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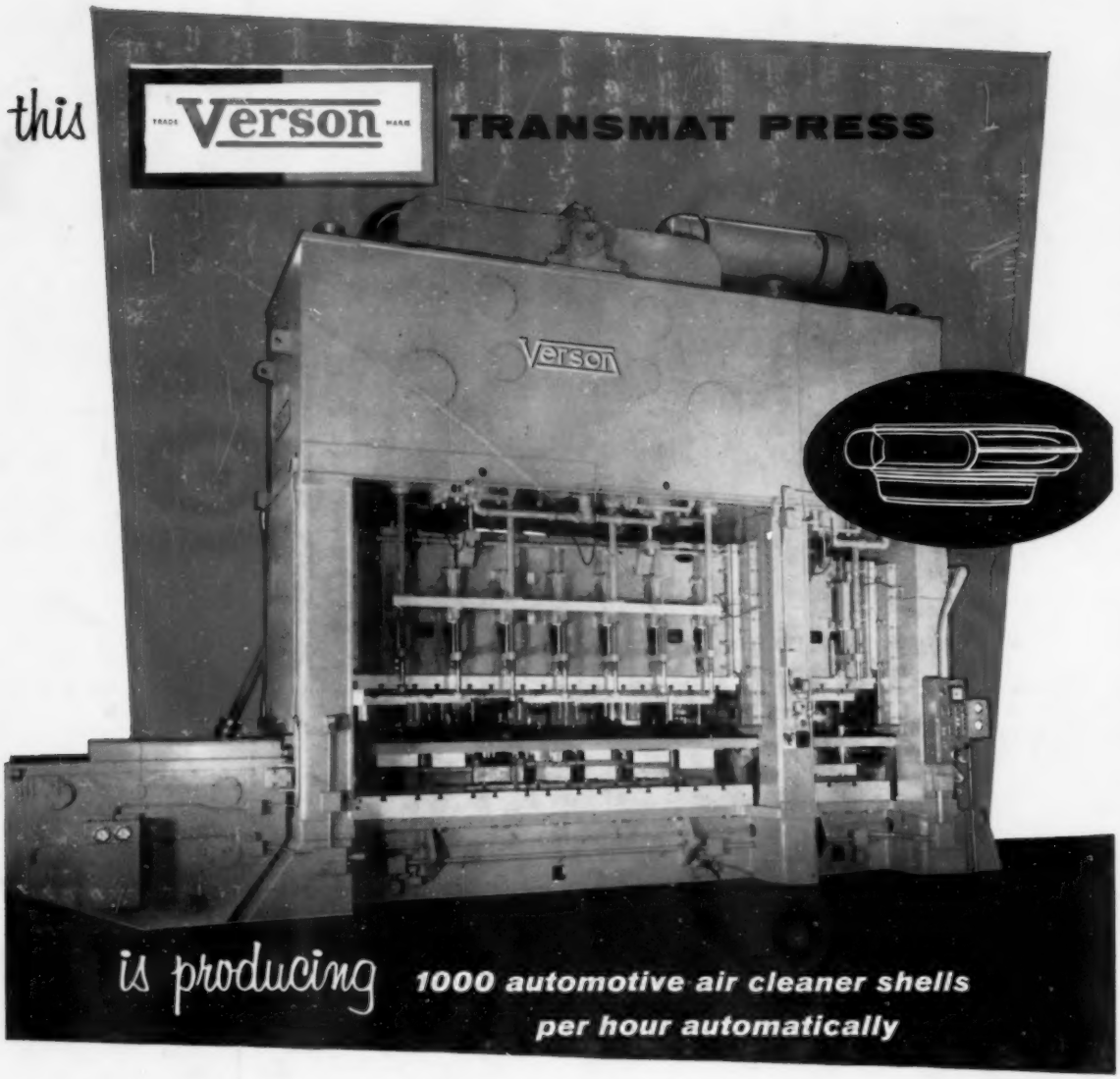


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